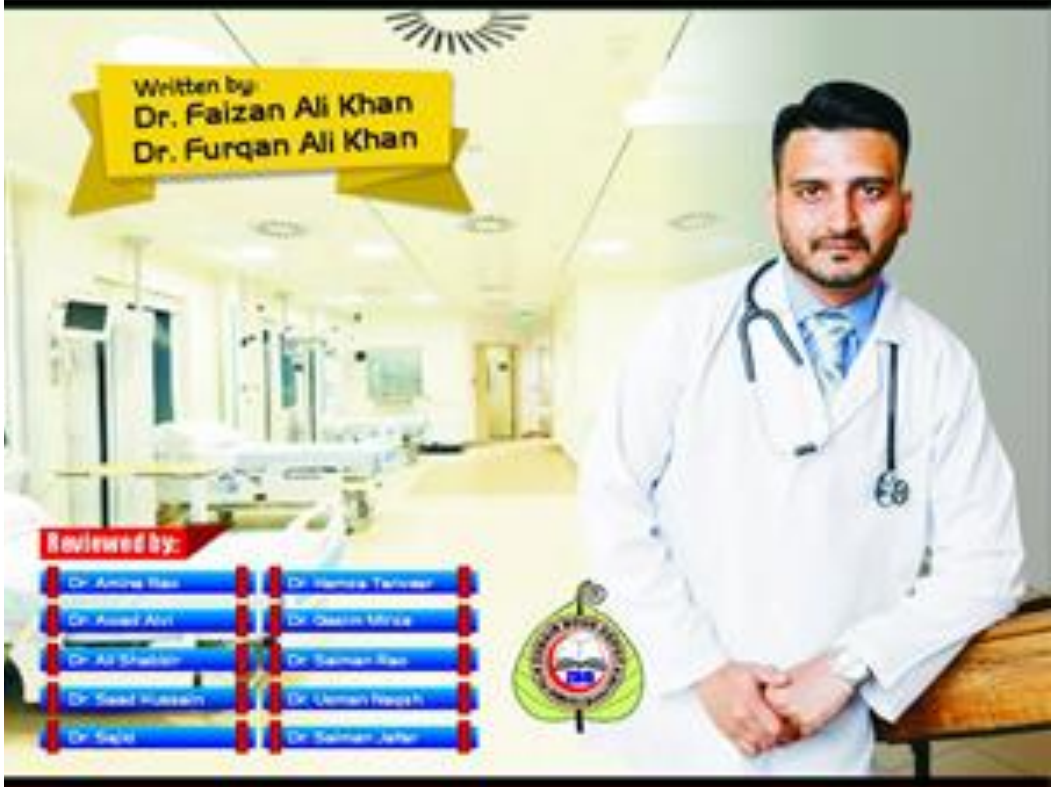
G-Friends

House Job PROTOCOL



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General ward protocol

THE BASICS

What to write?

General points

Note-writing is one of those tasks that is perceived to be very easy but is often done exceptionally badly. The reason for this is that it is often not taught at medical school and, as a House job doctor, you are expected to know what to write from your first day. There are several reasons to ensure that notes are kept well:

- They provide a clear and accurate account of the patient's management – if it's not written, it was not done.
- They allow communication to others of what was said and done.
- They are a legal document and can be used in court.
- They provide information for audit and research.
- There are some universal features that apply to note-making regardless of specialty or seniority:
- **Legibility:** 'doctors' handwriting' is thankfully now becoming a myth, although there are still examples around. You must make your writing legible. If it is not, and what you have written is misunderstood, you will not get the benefit of the doubt. You are now also required to write in black at all times, as this is much clearer if the notes are photocopied.
- **Patient identification:** every new sheet of paper in the notes should have at least three points of identification on it: (i) patient's name (surname and forename); (ii) patient's date of birth; and (iii) patient's hospital number. If the hospital number is unavailable, use the first line of the patient's address.

Date and time: every entry made in the notes must be dated (including the year – patients do return) and preferably timed. Timing is especially important when patients are acutely unwell or when there is a lot of activity, e.g. postoperatively.

Abbreviations: difficult to avoid but try to just use conventional ones, e.g. FBC and COPD, and write others out.

Signature: you must sign every entry you make in a set of notes. If your signature is illegible, then print your name beneath so it is clear who you are.

Clerking a patient:

The basic structure of any clerking is the same. How much detail there is in each section is variable, but the structure should be:

- patient details
- date and time of entry
- method of referral
- history
- examination
- impression
- investigations
- plan
- signature and bleep number

METHOD OF REFERRAL :

Whether the admission was as an emergency or elective/routine, and by whom the referral was made, e.g. GP or A&E.

HISTORY

Taking a history and documenting it is an art that you will develop throughout your medical career. The key is simplicity and clarity of thought. If your thoughts are a mess, this is reflected in your note-making.

If no history is available, e.g. if the patient is confused or has a reduced level of consciousness, you should try and obtain a history from other sources, e.g. relatives, nursing home, etc.

Presenting complaint (PC): This is usually one word – usually the patient's own, e.g. cough or breathlessness. Sometimes there can be two or three, e.g.

1. palpitations,
2. chest pain.

History of presenting complaint (HPC): This expands on the presenting complaint or complaints. An example is if the presenting complaint is 'Pain', go on to describe the onset of pain. When discussing times, try to use relative values such as '3 h ago' or '2 days ago' as opposed to 'yesterday'. The history is where the bulk of your clerking relevant to that admission will be. It is therefore acceptable to put in entries that will also be in other categories, such as past medical history, social history or medication.

Medication Documentation of the patient's drugs and their doses on admission is important because this will be what you base your prescription chart on. You will need to phone the patient's GP, or ask a relative to bring in any drugs a patient is taking, if the patient has not brought them to hospital or is unsure what they are. The key to the diagnosis could lie in what the patient is (or is not) taking.

Allergies: Allergies to drugs should always be asked about; omitting to do this is medicolegally indefensible.

Social history: This section is often overlooked but might be very relevant to

the patient's admission, particularly in older people. In this population it is important to know the level of independence and how much the patient can do normally, e.g. wash, dress, shop. A decrease in the level of function in a short time might be the only feature in the history leading to the admission, and might have an organic cause, e.g. infection.

Review of systems: This is a brief review of all systems not already covered by the main part of the history. This is there for completeness and to check you haven't missed any clinically relevant parts of the history.

EXAMINATION

Documentation of a clinical examination again is tailored to your history. Whereas a detailed neurological examination is mandatory for a patient presenting with a stroke, it is less relevant for a patient presenting for elective hernia repair.

Nevertheless, a competent efficient examination of the major systems (CVS, respiratory, abdominal and nervous) should lead to concise notes that reflect your clinical findings. These should always include vital signs such as pulse and blood pressure – this demonstrates that you have seen the relevant measurements and acknowledged them.

A note about CNS examination

Assessing power and reflexes involves a mysterious combination of fractions and crosses. Here is an explanation:

Grading of power

5/5	Normal
4/5	Slightly reduced
3/5	Able to overcome gravity, i.e. able to lift off bed
2/5	Unable to overcome gravity i.e. unable to lift off bed but can maintain
if raised	
1/5	Slight movement; muscle twitch only
0/5	No movement

Grading of reflexes

+++	Exaggerated
++	Normal

+	Present with reinforcement
+/-	Equivocal
-	Absent

IMPRESSION

This is what you think is going on with your patient. Everything that follows is tailored to prove or disprove your theory. It is not a diagnosis yet and no-one is going to shoot you if your impression is wrong.

INVESTIGATIONS

Although some of the investigations are 'routine', they are there so you can start proving your impression. For example, if you have a patient who presents with left-sided pleuritic chest pain and cough, your clinical impression might be that of pneumonia. You might also want to exclude a pneumothorax and a pulmonary embolism.

Investigations: (**Sample investigations list for a patient who presents with left-sided pleuritic chest pain and cough**.).

FBC
U + Es
Glucose
Cardiac enzymes
CRP
ECG
CXR
ABGs
Consider V/Q scan

PLAN

Your plan consists of two things:

1. your immediate management plan
2. your plan for the next 24–48 hours

This could be as simple as admitting the patient and reviewing the results of the tests with your seniors, or as complicated as administration of drugs and practical procedures. Try to avoid simply writing 'senior review' – if the patient is so sick your senior needs to review immediately you will not get a

chance to write any notes; if you do have time, then you also have time to think about what you want to do.

Progress notes and ward rounds

After you have clerked the patient, you will go on ward rounds, mostly under the supervision of a more senior doctor, who will quite often expect you to write in the notes as you go. You must therefore be aware of what is going on with the patients' management, and to do this you must be attentive to what is going on. If you do not understand – ask. This is particularly important on the post-take ward round, where the working diagnosis is decided. If you understand what is going on at this stage, not only will you learn how to manage patients for yourself in the future, but you will be able to write down the plan for the patient with confidence.

Progress notes broadly fall into the same categories as clerking notes:

- ❖ date and time
- ❖ who is leading the ward round
- ❖ history
- ❖ examination
- ❖ investigations
- ❖ plan
- ❖ signature

The difference is that you might write just one line for each. The emphasis is that each set of notes will follow on, so the reader who has never met the patient knows, what your plan is and why you are doing the tests you are.

An alternative scheme is 'SOAP':

- Subjective (i.e. how the patient feels)
- Objective (examination findings)
- Assessment (diagnosis, how things are progressing)
- Plan

Night working

Part of the job involves working in the evenings and at night. At this time, when you might be the only doctor awake in your specialty, it is even more important to document clearly the date and time you reviewed a particular patient. The patient is quite often not managed by your team in these situations and so it is important to document who you are – writing your surname at the top of your entry as well as signing your notes is a good way of ensuring this.

Notes of conversations:

In your day-to-day life, you will communicate with others regarding the management of patients. The range of people you will deal with is vast, from other healthcare professionals (doctors, nurses, physiotherapists, occupational therapists and social workers) to patients' relatives. If any of these have an impact on your patients' management, it should be documented so a clear record of events is recorded. This is particularly important if any facts are disputed at a later date. In all of these situations it is important to document when you had a conversation, and with whom. If a conversation with relatives and the patient takes place, note exactly who was present, e.g. 'Discussion with patient and family – daughter (Mrs E Smith) present'. When you talk to other healthcare professionals, particularly outside your specialty, then their names should be taken so that it is clear with whom the patient was discussed: 'D/w Mr Shah, Surgical Reg on call' with a time documented is better than 'D/w Surgical Reg'. This is particularly important at night, when you might be required to wake someone for advice and their recollection might not be as good as yours in the morning. Precisely document the issues raised in a conversation, particularly if discussing issues with relatives or involving consent.

Old notes and summaries:

Quite often you will admit patients who have had several hospital admissions and are well known to the hospital. In this situation, obtaining the old notes is invaluable because they can provide you with another source of information to corroborate your patient's history, particularly if this is unreliable. Secretaries and ward clerks are useful allies in this respect and often find the means of retrieving these sometimes- elusive items for you. Unfortunately, on arrival, old notes couldn't look more different from the important medicolegal documents they are supposed to

be. However, taking the time to sift through the notes and summarizing the patient's history can be extremely useful and most senior doctors will do this routinely to get a handle on a patient's condition. Doing this will help improve your knowledge of the patient's history. Your summary is just that – it need not be an essay – but a list of important milestones in a patient's history can sometimes reveal glaring omissions, which could earn you valuable points on a consultant ward round, not to mention improving the care of your patient.

Filling in forms

One of the mundane tasks of any foundation doctor is form filling. This seemingly menial task has often been felt to be beneath doctors, a task that should be delegated to secretaries or ward clerks. Although it is true that some of it is fairly mundane, only someone with adequate medical knowledge will know which test is indicated and what question they would like answered. As a result, correct form filling is still an essential skill.

Although forms vary from Hospital to Hospital, the basics are similar:

- Three forms of identification are usually needed: patient name, date of birth and hospital number (or address).
- The patient's location, e.g. ward or outpatients.
- Your name and bleep number.
- Your signature.

If any of these are not present, the request for bloods or investigations will be sent back to you. You will have wasted their time and your own.

Blood forms: These are by far the most common forms you will fill in. You should make absolutely sure that the patient's details are correct, particularly when ordering blood products. The section marked 'Clinical Details' should also be filled in – this can be as brief as 'On ACE inhibitor' if you are checking some U+Es on a patient, to more complex details for rarer tests. If the

test is urgent, mark it so on the form and phone the lab to let them know that the sample is on its way.

X-ray forms: Although patient details are as important on radiology request forms as they are on blood forms, the clinical details section of this form is absolutely vital.

Whatever investigation is requested, remember that the radiologists will not know the patient as well as you do. In fact, the only clinical information the radiologists will have about the patient is what you write in this section – if you give them rubbish, you will get rubbish back in the report. Radiologists need this section to understand what information you hope to gain by performing the investigation. If you do not ask a specific question or do not give the appropriate details, the investigation and subsequent report will not be targeted to your needs.

Your clinical details need not be an essay – just a summary of the patient's clinical state and the question that needs to be answered. Again, knowledge of the patient's working diagnosis is crucial to do this properly, so when you request a test make sure you understand what is going on. It is far harder to explain the patient's state to someone else if you do not know it yourself. So:

- if requesting a chest X-ray, write: 'SOB, cough, smoker 30/day ?infection, ?underlying malignancy'
- or if you are requesting a CT of the brain for a patient who has had a stroke, write: 'Left-sided weakness leg and arm. Dysarthria. Stroke – exclude haemorrhage'

Some departments require you to discuss anything but a simple X-ray with one of the radiologists. Don't be scared. In your first weeks this task might seem intimidating

- the key is knowing why the test has been requested so that you are prepared if you are confronted with questions.

Drug charts

Prescribing drugs is an important job that needs to be done accurately. Again, the forms vary between hospitals but the basic

layout is consistent. Patient details are found on the front page, together with a section for drug allergies. Both of these sections should be filled in accurately (patient's name, ward, hospital number, etc.).

PRESCRIBING

To prescribe any drug, certain elements should be present:

- Patient details.
- Name of the drug: try to use generic names, not trade names, e.g. metoclopramide not Maxalon. Always prescribe in capitals so there is no doubt as to what you are prescribing
- **Dose of drug:** make sure you know this and that it is written clearly. Make the units clear – g or mg or mg.
- **Method of delivery:** PO (oral), IM (intramuscular), IV (intravenous), SC (subcutaneous), NG (via nasogastric tube). Some hospitals require you to write abbreviations out in full.
- **Frequency of administration:** OD (once daily), BD (twice daily), TDS (three times a day), QDS (four times a day), prn (as required).
- **Times of administration:** there are set times for drug rounds on a ward but stating the times for drug administration is important, particularly for single doses or once daily drugs.
- **Date of prescription:** give the date that the drug was first prescribed during the admissions, not the date you rewrote the drug chart.
- **Your signature:** no drug can be administered without this. Other details, such as for how long a drug is prescribed (e.g. for antibiotics), might also be required.

DIFFERENT TYPES OF DRUG CHART

There are usually three ways of prescribing drugs: as one-off doses, as regular doses or on an ‘as-required basis’. As a result, there are three sections on a drug chart for all of these.

- ‘One-off’ doses are usually prescribed on the front of the chart. This is for single doses of medication prescribed in emergencies, when only a single dose of a particular drug is required, or when the dose changes after each administration. Here times should be documented in 24-hour clock, or as ‘stat’ (immediate) doses .
- Regular medications are prescribed inside and comprise the bulk of the chart. Again, be clear about times and what you are prescribing.
- The as-required medication section is important for minor prescribing such as analgesia and antiemetics. Always prescribe a maximum dose to prevent overdosing.

When amending a drug chart, cross-out the entry clearly and rewrite the prescription Multiple crossings out on one entry lead to errors in dispensing.

Death certification

People die in hospitals. When they do, they create a mass of paperwork that must be filled in correctly to prevent any delay in what is already a difficult time for relatives.

The first stage is to declare the patient dead. Many, many stories are told of doctors declaring a patient dead, only for the patient to ‘come back to life’, causing embarrassment all round.

Deaths in hospital are either expected or after a failed resuscitation at cardiac arrest. In the post-arrest situation, do not certify immediately but leave the room and write up your notes. Return after a few minutes and examine the body at that stage. If you are called to an expected death, go to the ward promptly so the patient’s relatives can be called and the body then removed to the mortuary.

Examination of the patient should involve:

- checking the response to a painful stimulus

- checking the major pulse – carotid or femoral – for 60 s
- listening for heart sounds
- watching and listening for breath sounds for at least 3 min
- checking pupil reaction to light

If all of these are negative then fully document the time of death, the time you certified the patient, your findings confirming death and sign your entry.

DEATH CERTIFICATES

The death certificate is a legal document and as a result must be filled in correctly, not least because bereaved relatives are usually waiting for them. They should not be inconvenienced any more than is necessary.

The first question you should ask yourself when you are required to sign a death certificate is **'Can I write it?'** Usually you are managing the patient and the diagnosis is clear; if the death is expected then the underlying condition is usually known and the cause of death is obvious. If you do not know the cause of death, or cannot make a reasonable assumption, you should discuss this with your seniors and a post-mortem examination should be made. This is done through the coroner, who will request the post-mortem on your behalf. This must always be discussed with deceased patients' relatives, which can be difficult, so proceed with compassion but always explain the importance and that a certificate cannot be issued without a cause of death.

There are other reasons why a death should be referred to the coroner. The Office of National Statistics has given a list of these situations.

When writing a death certificate, do not use abbreviations. Write dates in words and write legibly – use capitals. The cause of death is split into several sections:

- Ia – Disease or condition directly leading to death: this is the direct cause of death, e.g. myocardial infarction, bronchopneumonia. The 'failures', e.g. acute renal failure, hepatic failure or congestive cardiac failure can be used but must be qualified in section Ib with an underlying diagnosis.
- Ib – Other disease or condition, if any leading to Ia: this is the underlying disease condition, e.g. chronic obstructive airways disease, ischaemic heart disease.
- Ic – Other disease or condition, if any, leading to Ib: if any underlying condition encompasses all of the other categories, then this should

be included here. This might include conditions that could be in sections Ia and Ib, for example:

- Ia bronchopneumonia
  Ib chronic obstructive airways disease
- Ia septicaemia
  Ib bronchopneumonia
  Ic acute myeloid leukaemia.

- II – Other significant conditions contributing to death but not related to the disease or condition causing it: this is any other significant comorbidity, for example:
  - Ia respiratory failure
    Ib disseminated carcinomatosis
    Ic carcinoma of prostate
  - II chronic obstructive airways disease.

Avoid diagnoses such as 'old age' – the patient might have been old but was in hospital for a reason. Do not make up a diagnosis if you are not sure – contact your seniors or discuss it with a pathologist or the coroner if you are in any doubt.

Cremation forms

As with death certificates, the expeditious completion of cremation forms is essential to allow cremation to take place without added delay and distress to the family of the deceased. It is often a good idea to fill in your part of the cremation form at the same time as the death certificate, and with the prevalence of shift systems within medicine nowadays, this is doubly important. Your successor might not have looked after the patient and will therefore be unable to fill in the cremation form.

The following are a few points worth noting when filling in cremation forms:

- You must fill in all the boxes for your part (first part) of the cremation form. Make sure that the causes of death that you put down are exactly the same as those on the death certificate.
- You must see the body after death. Go and visit the morgue, check the face and name tag, and feel for a pacemaker on the chest wall. Check in the notes that no radioactive implants have been used.

- You are asked for the mode of death. This is a somewhat artificial construct, but if death was sudden, use ‘syncope’, if comatose, use ‘coma’ and if death was a slow decline struggling against illness, use ‘exhaustion’.
- Check the notes carefully to ensure that no operation was conducted within a year of death. If it was, speak to your seniors.

Consenting patients

In an ideal world, as a foundation doctor you would not obtain consent for operations and procedures; this task is most appropriately done by the person who will be carrying out the procedure. However, you will still be called upon to explain procedures and obtain consent, and the medicolegal aspects of obtaining valid informed consent become ever more stringent as the years pass. Check your local guidance, on obtaining informed consent.

Do you know what the procedure is? Go and see the operations and procedures that you will be consenting people for. If you don’t know what the procedure involves, you should not consent the patient.

Do you know what the complications are? Nowadays, it is a good idea to know what the complication rates within your unit are. In a couple of years’ time, you will need to know the complication rates for the operator who will perform the procedure.

How should you explain the procedure? You will find that you develop a **‘patter’** for the more common procedures. Do not let this hinder your ability to communicate effectively – everyone needs a slightly different way of explaining things:

- avoid jargon
- start with why the procedure is needed
- explain the type of anaesthetic (if known; otherwise leave this to the anaesthetist)
- explain the procedure

- explain what will happen after the procedure; tell patients where they will be and whether they will have tubes sticking out of them
- explain how long it will take to recover
- explain the complications

It is very helpful to use pictures to explain procedures. Draw a picture on the back of the consent form (to prove that you have used pictures) or give patients a drawing.

How much should you tell patients?

It used to be taught that anything below a 1% risk of serious injury or death did not need to be disclosed to patients, in case they were frightened unnecessarily from having vital procedures. Ethics and expectations have changed and the medicolegal climate is now moving towards an expectation that patients are told any fact that might conceivably affect their decision to consent. Thus, all risks of death or serious injury should probably be disclosed.

Be guided by the patients – if they want to know, tell them.

You don't think your patient is competent to consent Do not force patients to sign the form if you are not sure that they are competent. Some problems are easily solved – make sure that any hearing aid is switched on and that the patient's reading glasses are to hand.

Confused patients or those who are too ill to give consent are a different matter.

The law states that such patients (if adults) can be treated under common law without informed consent provided that such treatment is in the patient's best interests. No-one other than the patient can give consent to treatment.

Most hospitals have forms that relatives or other doctors can sign in such circumstances. Relatives cannot give consent on behalf of adults (parents can on behalf of children, however) and such forms have no legal standing. Seeking assent from relatives is, however, good ethical practice but the needs of the adult patient

should always prevail over the wishes of relatives. The exception is a patient with a relative who holds welfare power of attorney.

Breaking bad news

There is no easy way to break bad news and there is no single right way of doing it.
Breaking bad news is – by its very nature – a painful process, both for the recipient and the giver of the news. There is no shame at all in showing emotion during the process – indeed, the day you stop feeling anything when you break bad news is the day you should leave medicine.
There are a few ways that you can make the task of breaking bad news less traumatic for the recipient:

- Find out how much the patient knows or suspects. This is easier if you have got to know the patient or relatives beforehand.
- Select a time and place where you have privacy and time – do not give bad news in the middle of the ward round. Consider a private room rather than just pulling the curtains round, and give your bleep to someone.
- Ask a member of the nursing staff to accompany you and – if the patient wishes – a close relative.
- Ensure that you know the plan and the prognosis before you start.
- Try and break the bad news in stages. Ideally, the stage should have been set in the days leading up to the breaking of the news.
- **Avoid jargon**. If the patient has cancer, say ‘cancer’ – not tumour, malignancy, growth or any other euphemism.
- Be frank but not overly precise. You don’t actually know how long the patient will survive.

- Always leave the person with some hope, but ensure that this is not delivered frivolously. ‘Cheer up, it might never happen’ is clearly not going to help matters.
- No matter how busy you are, give enough time to the person. Don’t keep sneaking a look at your watch.
- Don’t be afraid of offering physical contact, but don’t feel that you have to offer this.
- Crying, shouting, anger and laughter are all emotional responses that can be precipitated by bad news – as is silence. Give time for the recipient to express any emotions and don’t feel that every silence has to be filled with your meaningless babble.
- Deliver information a bit at a time. People in shock do not remember much (another reason to have nursing staff and relatives present). The recipient will not be able to remember the details of the side-effects of chemotherapy if you explain them at the same time as delivering the diagnosis of cancer.
- Finish by letting the recipient know that you will be around to answer any questions or to talk further. Written information can also be very helpful. It is a good idea to go back later and check how much of the information the recipient took in. Better still, do this before the oncologists or surgeons come to talk about further therapy.

Talking to relatives:

- Good communication extends well beyond talking to your patients keeping the relatives in the picture is not only courteous but helps to facilitate discharge and improves the care and support that your patients will receive both in and out of hospital.

The following are a few points to bear in mind:

- Always ask patients whether they mind you speaking to their relatives.
- Involve the relatives early, and keep them involved. Be proactive; don’t wait for them to come and find you.

- Listen to the concerns of relatives, for instance, about the ability of older, frail patients to manage on their own.
- Don’t forget that relatives are carers and that they often need support to keep caring for your patient.
- In large families, agree on one person to act as the conduit for discussion. This can reduce the amount of time that you spend repeating yourself.
- Don’t forget that families have their own internal dynamics. Two halves of a family might not speak to each other and some relatives might not want what your patient wants. Despite this, don’t be cynical about people’s motives – not all family squabbles are about father’s last will and testament. If things start to get complicated, get your seniors involved.
- Relatives can get angry about perceived delays in diagnosis, treatment, discharge, or about the fact that their relative is dying. Grief, fear and guilt can all play a part and the best policy is to listen a lot, stick to the facts and write everything down. If genuine mistakes have been made, apologize, but do not feel that you should make promises that you cannot personally keep, e.g. dates of discharge, times of investigations.
- Tell your patients how much their relatives know, and vice versa. This eases communication within the family.
- Some families wish to withhold bad news from the patient and will ask you not to tell the patient the diagnosis or prognosis. You are not bound by their wishes, but seek to persuade the family that disclosure would be the best policy, rather than barging in and breaking the news without the family onside.
- Write a summary of your conversations with relatives in the notes.

HOW TO DOCUMENT A PATIENT ASSESSMENT [SOAP(Subjective/Objective/Assessment/Plan)]

Subjective

The subjective section of your documentation should include how the patient is currently feeling and how they've been since the last review in their own words.

So as part of your assessment you may ask:

"How are you today?"

"How have you been since the last time I saw you?"

"Have you currently got any troublesome symptoms?"

"How has the nausea been?" (or any other relevant symptom)

If the patient mentions multiple symptoms you should explore each of them, having the patient describe them in their own words.

You should document the patient's responses accurately and use quotation marks if you are directly quoting something the patient has said.

Objective

This section needs to include your objective observations, which are things you can measure, see, hear, feel or smell.

Objective observations

Patient's appearance (e.g. "Patient appears very pale and in discomfort")

Basic observations (vital signs):

Blood pressure

Pulse rate

Respiratory rate

Oxygen saturations (including the amount of oxygen the patient is receiving if relevant)

Temperature (including any recent fevers)

Fluid balance (fluids going in and coming out):

Oral fluids

Nasogastric fluids/feed

Intravenous fluids

Urine output

Vomiting

Drain output / stoma output

Clinical examination findings:

"Widespread expiratory wheeze on auscultation of the chest"

"Abdomen soft and non-tender"

"Pulse irregular"

"No cranial nerve deficits"

Other investigation results:

Recent lab results (e.g. bloods/microbiology)

Imaging results (e.g. chest x-ray/CT abdomen)

Assessment

The assessment section is where you write your thoughts on the salient issues and the diagnosis (or differential diagnosis), which will be based on the information collected in the previous two sections.

Summarise the salient points:

Productive cough (green sputum)

Increasing shortness of breath

Tachypnea (respiratory rate 22) and hypoxia (O2 saturations 87% on air)

Right basal crackles on auscultation

Bloods – Raised white cell count (15) / Raised CRP (80)

Chest x-ray – increased opacity in the right lower zone in keeping with consolidation

Document your impression of the diagnosis (or differential diagnosis):

Impression – Community acquired pneumonia

If the diagnosis is already known and the findings of your assessment remain in keeping with that diagnosis, you can comment on whether the patient is clinically improving or deteriorating:

On day 3 of treatment for community acquired pneumonia

Reduced shortness of breath and improved cough

Oxygen saturations 98% on air / Respiratory rate 15

Bloods – CRP decreasing (20) / White cell count decreasing (11)

Impression – Resolving community acquired pneumonia

Plan

The final section is the plan, which is where you document how you are going to address or further investigate any issues raised during the review.

Things to consider including in your plan:

Further investigations – laboratory tests/imaging

Treatments – medications/IV fluids/oxygen/nutrition

Referrals to various specialties

Review date/time – "I will review at 4pm this afternoon"

Frequency of observations/monitoring of fluid balance

Planned discharge date if relevant

WRITING IN THE NOTES – AN OVERVIEW

The basics

Ok, so a blank continuation sheet has been thrust towards you and you've been asked to document something- let's remind ourselves of the basics of documentation.

What should I use to write with?

You need to use a pen with black ink (as this is the most legible if notes are photocopied).

Patient details

For every new sheet of paper your first task should always be documenting at least three key identifiers for a patient:

Full name

Date of birth

Unique patient identifier

Patient's home address

If a patient label containing at least 3 identifiers is available then this can be used instead of writing out the information yourself.

Location details

You should indicate the patient's location on the continuation sheet:

Hospital

Ward

Making a new entry in the notes

At this point you should already be holding a pen with black ink and you should have ensured the continuation sheet has at least three key patient identifiers at the top.

How to make an entry in a patient's notes

1. Add the date and time (in 24hr format) of your entry

2. Write your name and role as an underlined heading

3. Make your entry in the notes below this heading (see our other documentation guides for more detail on making different types of entries in the notes)

4. At the end of your entry to need to include the following:

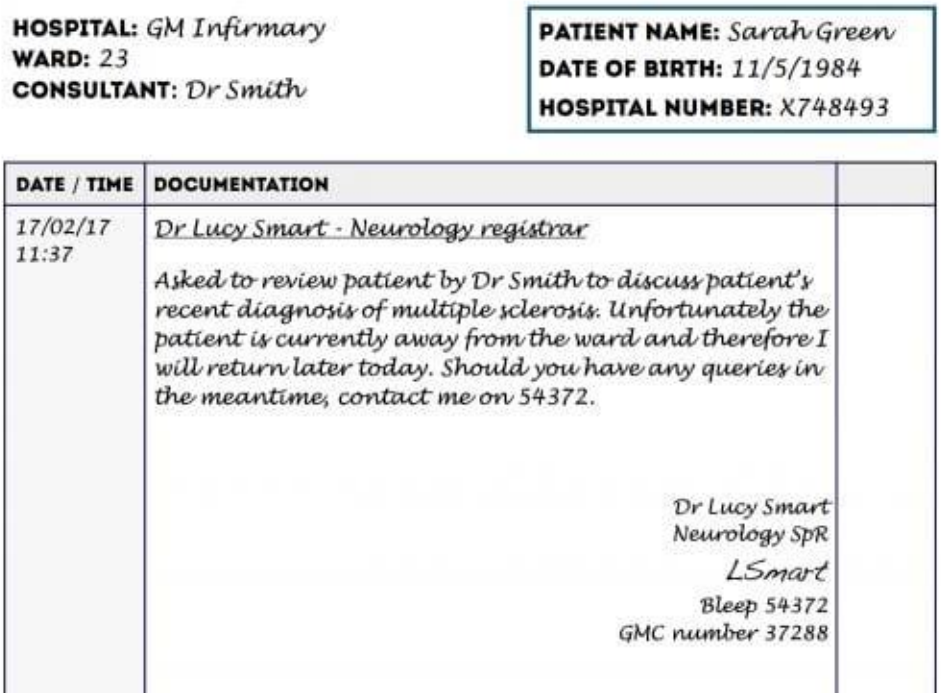
Your full name

Your grade/role (e.g. Medical student/F2/Neurology registrar)

Your signature

Your professional registration number (e.g. GMC number)

Your contact number (e.g. phone/bleep)



HOSPITAL: GM Infirmary
WARD: 23
CONSULTANT: Dr Smith

PATIENT NAME: Sarah Green
DATE OF BIRTH: 11/5/1984
HOSPITAL NUMBER: X748493

DATE / TIME	DOCUMENTATION	
17/02/17 11:37	Dr Lucy Smart - Neurology registrar Asked to review patient by Dr Smith to discuss patient's recent diagnosis of multiple sclerosis. Unfortunately the patient is currently away from the ward and therefore I will return later today. Should you have any queries in the meantime, contact me on 54372. Dr Lucy Smart Neurology SpR LSmart Bleep 54372 GMC number 37288	

Other things to be aware of…

What if your entry spans more than one page?

If your entry in the notes happens to span more than one page:

1. Write “continued on next page” or “continued” with an arrow pointing off the page after the entry on the first page

2. Write your name, signature, professional registration number and contact number at the end of this partial entry

3. Add the patient’s name, date of birth and unique identifier to the new page

4. Write the date and time of the entry on the second page

5. Write your name and role, followed by the word “continued” as an underlined heading

6. You can now continue the entry from the previous page

7. At the end of this entry you need to include all of your details as shown in step 4 of the previous section

Although this might seem tedious it’s actually really important, as it ensures the chronology of your entry is clear to others reading it later.

17/02/17 11:37	Dr Lucy Smart - Neurology registrar Asked to review patient by Dr Smith to discuss patient's recent diagnosis of multiple sclerosis. Continued on next page... Dr Lucy Smart LSmart GMC number 37222 Bleep 54372	

GEEKY MEDICS

HOSPITAL: GM Infirmary
WARD: 23
CONSULTANT: Dr Smith

PATIENT NAME: Sarah Green
DATE OF BIRTH: 11/5/1984
HOSPITAL NUMBER: X748493

DATE / TIME	DOCUMENTATION	
17/02/17 11:38	Dr Lucy Smart - Neurology registrar - continued Unfortunately the patient is currently away from the ward and therefore I will return later today. Should you have any queries in the meantime, contact me on 54372. Dr Lucy Smart Neurology SpR LSmart Bleep 54372 GMC number 372	

What if you are too busy dealing with sick patients to write in the notes at the time?

You should always try to document your patient encounters as promptly as possible to reduce the risk of you forgetting key details and also to ensure other team members are aware of any changes to a patient's condition or management plan. However in reality this isn't always possible, for instance if you're dealing with an acutely unwell patient you need to prioritise their management over the documentation of the sequence of events.

When you return to the patient's notes at a later time you need to:

1. Ensure the continuation sheet has the patient's 3 key identifiers as previously described

2. Document the current time and date of your entry

3. Write your name and grade as an underlined title

4. Begin the entry by stating that this is written in retrospect, with the time the entry is referring to documented

5. Complete the entry in the notes

6. At the end of this entry you need to include all of your details as shown in step 4 of the making an entry in the notes guide above.

HOSPITAL: GM Infirmary
WARD: 23
CONSULTANT: Dr Smith

PATIENT NAME: Sarah Green
DATE OF BIRTH: 11/5/1984
HOSPITAL NUMBER: X748493

DATE / TIME	DOCUMENTATION	
17/02/17 11:37	Dr Lucy Smart - Neurology registrar WRITTEN IN RETROSPECT: assessment of patient at 10:00 today.	

What if I write something incorrectly in the notes?

If you make a mistake whilst making your entry (e.g. factual error/spelling error):

Simply cross the mistake out with a single line through the erroneous words

Write your signature in addition to the time and date beside the area crossed out

Do not use Tipp-Ex to erase the errors

Do not excessively scribble over the errors to make them unreadable

DATE / TIME	DOCUMENTATION	
17/02/17 11:37	Dr Lucy Smart - Neurology registrar LSmart 17/2/17 11:39 Asked to review patient by ~~Dr Stone~~ Dr Smith to discuss patient's recent diagnosis of multiple sclerosis. Unfortunately the patient is currently away from the ward and therefore I will return later today. Should you have any queries in the meantime, contact me on 54372.	

References

1. Royal College of Physicians – Generic medical record keeping standards. 30th June 2015.

INTRAVENOUS (IV) FLUID PRESCRIBING IN ADULTS

Indications for IV fluids

Intravenous (IV) fluids should only be prescribed for patients whose needs cannot be met by oral or enteral routes. Where possible oral fluid intake should be maximized and IV fluid only used to supplement the deficit.

Examples of when IV fluids may be required:

Patient is nil by mouth (NBM) – e.g. bowel obstruction, ileus, pre-surgery

The patient is vomiting or has severe diarrhea

The patient is hypovolemic as a result of blood loss (blood products will likely be required in addition to IV fluid)

Types of fluids

IV fluids can be categorized into 2 major groups:

Crystalloids: solutions of small molecules in water (e.g. sodium chloride/Hartmann's/dextrose)

Colloids: solutions of larger organic molecules (e.g. albumin/Gelofusine)

These are used less often than crystalloid solutions as they carry a risk of anaphylaxis and research has shown that crystalloids are superior in initial fluid resuscitation [2]

Introduction to prescribing IV fluids

When prescribing IV fluids, **remember the 5 Rs:**

- Resuscitation
- Routine maintenance
- Replacement
- Redistribution
- Reassessment

To decide what fluids we might need to prescribe we need to first carry out an initial assessment, as shown in the next section.

Initial assessment

The initial assessment involves assessing the patient's likely fluid and electrolyte needs from their history, clinical examination and available clinical monitoring (e.g. vital signs, fluid balance). Your clinical

examination and review of available clinical monitoring should be performed using the ABCDE approach, with a focus on the patient's fluid status.

History

Fluid intake – has this been reduced?

Thirst

Dizziness/syncope

Abnormal fluid loss:

Vomiting (or NG tube loss)

Diarrhoea (including stoma output)

Polyuria

Fever

Hyperventilation

↑ drain output – e.g. biliary drain/pancreatic drain

Co-morbidities – e.g. heart failure/renal failure

Clinical examination and review of clinical monitoring

Airway – is the airway patent?

Breathing:

Respiratory rate and oxygen saturations

Auscultate the lung fields

Circulation:

Pulse and blood pressure

Capillary refill time

Jugular venous pressure (JVP)

Peripheral oedema

Disability:

GCS

Exposure:

Wounds

Drains

Catheter output

Abdominal distension/peripheral oedema

Fluid balance charts/weight charts

Other losses – e.g. rectal bleeding

Next steps

If after your initial assessment you feel there is evidence of hypovolaemia your next step would be to initiate fluid resuscitation as shown in the next section. If however the patient appears stable and normovolaemic you can skip this step and move straight to calculating maintenance fluids. If you consider the patient to be hypervolaemic, do not administer IV fluids. Manage as appropriate.

Resuscitation fluids

Ok, so you've performed your initial assessment and things aren't looking great, the patient has clinical signs suggestive of hypovolaemia (as shown above) and therefore you need to prescribe some resuscitation fluids. In addition you need to start considering the cause of the deficit and take appropriate actions to treat it (e.g. the patient is septic so antibiotics need to be administered).

Initial fluid bolus

1. Give an initial 500 ml bolus of a crystalloid solution (e.g NaCl 0.9%/Hartmann's solution) over less than 15 minutes.

Reassess the patient

2. After administering the initial 500 ml fluid bolus you should reassess the patient using the ABCDE approach, looking for evidence of ongoing hypovolaemia as you did in your initial assessment (if you find yourself unsure about whether further fluid is required you should seek senior input).

3. If the patient still has clinical evidence of ongoing hypovolaemia give a further 250-500 ml bolus of crystalloid solution, then reassess as before using the ABCDE approach.

You can repeat this process if there is ongoing clinical evidence suggestive of the need for fluid resuscitation up until you've given a total of 2000 ml of fluid.

If despite giving 2000ml you reassess and find there is still ongoing need for fluid resuscitation (i.e. persistent hypovolaemia), you should seek expert help.

If patients have complex medical co-morbidities (e.g. heart failure, renal failure) and/or are elderly then you should apply a more cautious approach to fluid resuscitation (e.g. giving fluid boluses of 250 ml rather than 500 ml and seeking expert help earlier)

If the patient appears normovolaemic but has signs of shock you should seek expert help immediately.

Daily requirements

Once the patient is haemodynamically stable their daily fluid and electrolyte requirements can be considered.

You should review the patient as discussed in the initial assessment section, but also review key laboratory results to better understand the patient's current fluid and electrolyte status:

History

Clinical examination

Clinical monitoring

Laboratory monitoring – electrolytes/renal function/haemoglobin (haemorrhage)

Once you have collected the above information you need to decide if you feel the patient can meet their fluid and/or electrolyte needs orally or enterally.

Patient able to meet their fluid and/or electrolyte needs orally/enterally

No further IV fluids should be required

Patient unable to meet their fluid and/or electrolyte needs orally/enterally

Consider if they have any of the following issues:

Complex fluid issues

Electrolyte replacement issues

Abnormal fluid distribution issues

Those patients who have any of the above issues will likely require fluid replacement and/or redistribution (explained in the associated section below).

Those patients who do not have any of the above issues but are unable to meet their fluid requirement should receive routine maintenance IV fluids (see next section).

Routine maintenance fluids

If the patient is haemodynamically stable, but is unable to meet their daily fluid requirements via the oral or enteral route you will need to prescribe maintenance fluids. If possible these fluids should be

administered during daytime hours to prevent sleep disturbance.

Calculating maintenance fluids

Daily maintenance fluid requirements (as per NICE guidelines):

25-30 ml/kg/day of water and

approximately 1 mmol/kg/day of potassium, sodium and chloride and

approximately 50-100 g/day of glucose to limit starvation ketosis (however note this will not address the patient's nutritional needs)

Weight-based potassium prescriptions should be rounded to the nearest common fluids available. Potassium should NOT be manually added to fluids as this is dangerous.

Other factors to consider prior to prescribing

Obese patients

When prescribing routine maintenance fluids for obese patients you should adjust the prescription to their ideal body weight.

In addition you should use the lower range for volume per kg (e.g. 25 ml/kg rather than 30 ml/kg) as patients rarely need more than 3 litres of fluid per day.

Other patient groups where you should consider prescribing less fluid

For the following patient groups you should use a more cautious approach to fluid prescribing (e.g. 20-25 ml/kg/day):

Elderly patients

Patients with renal impairment or cardiac failure

Malnourished patients at risk of refeeding syndrome

Reassessment and monitoring

Continue to monitor the patient and reassess regularly:

Bloods – electrolytes/renal function/haemoglobin

Clinical examination – hydration status

Stop intravenous fluids once they are no longer required.

Nasogastric fluids or enteral feeding is preferable when maintenance needs are more than 3 days.

Replacement and redistribution of fluids

Some patients will require a slightly different approach than the routine fluid maintenance regime explained in the previous section.

These are patients who have one or more the following:

Existing fluid or electrolyte deficits or excesses

Ongoing abnormal fluid or electrolyte losses

Redistribution and other complex issues

Existing fluid or electrolyte deficits/excesses

Patients with existing fluid or electrolyte abnormalities require a more tailored approach to fluid prescribing (see basic examples below):

Dehydration – will require more fluid than routine maintenance

Fluid overload – will require less fluid than routine maintenance

Hyperkalaemia – will require less potassium

Hypokalaemia – will require more potassium

Estimate any fluid or electrolyte deficits/excesses:

Add or subtract these estimates from the standard routine maintenance fluid regime discussed in the last section to provide a more tailored fluid prescription

Ongoing abnormal fluid or electrolyte losses

Recognising ongoing abnormal fluid or electrolyte losses can allow you to tailor your fluid prescription to prevent later complications (e.g. hypokalaemia).

Consider the following sources of ongoing fluid or electrolyte loss:

Vomiting/NG tube loss

Diarrhoea

Stoma output loss (colostomy, ileostomy)

Biliary drainage loss

Blood loss (e.g. malaena/haematemesis)

Sweating/fever/dehydration (reduced or absent oral intake)

Urinary loss – e.g. diabetes insipidus/post AKI polyuria

Redistribution and other complex issues

Patients can have issues with fluid distribution (e.g. fluid in the wrong compartment) and a collection of other complex issues which should also be considered prior to prescribing fluids:

Gross oedema

Severe sepsis

Hypernatraemia/hyponatraemia

Renal, liver and/or cardiac impairment

Post-operative fluid retention and redistribution

Malnourishment and refeeding issues

You should seek senior input for patients with complex issues such as those above to ensure appropriate fluids are prescribed.

References

1. National Institute for Health and Care Excellence (2013 (updated 2016)). Intravenous Fluid Therapy In Adults In Hospital. Retrieved from: https://www.nice.org.uk/guidance/cg174/chapter/1-Recommendations#resuscitation-2

2. National Institute for Health and Care Excellence (2013 (updated 2016)). Intravenous Fluid Therapy In Adults In Hospital. Research recommendations. Retrieved from: https://www.nice.org.uk/guidance/cg174/chapter/2-Research-recommendations

Biopsy

Overview

In some cases, your doctor may decide that he or she needs a sample of your tissue or your cells to help diagnose an illness or identify a cancer. The removal of tissue or cells for analysis is called a biopsy.

While a biopsy may sound scary, it's important to remember that most are entirely pain-free and low-risk procedures. Depending on your situation, a piece of skin, tissue, organ, or suspected tumor will be surgically removed and sent to a lab for testing.

PURPOSE

Why a biopsy is done

If you have been experiencing symptoms normally associated with cancer, and your doctor has located an area of concern, he or she may order a biopsy to help determine if that area is cancerous.

A biopsy is the only sure way to diagnosis most cancers. Imaging tests like CT scans and X-rays can help identify areas of concerns, but they can't differentiate between cancerous and noncancerous cells.

Biopsies are typically associated with cancer, but just because your doctor orders a biopsy, it doesn't mean that you have cancer. Doctors use biopsies to test whether abnormalities in your body are caused by cancer or by other conditions.

For example, if a woman has a lump in her breast, an imaging test would confirm the lump, but a biopsy is the only way to determine whether it's breast cancer or another noncancerous condition, such as polycystic fibrosis.

Types of biopsies

There are several different kinds of biopsies. Your doctor will choose the type to use based on your condition and the area of your body that needs closer review.

Whatever the type, you'll be given local anesthesia to numb the area where the incision is made.

Bone marrow biopsy

Inside some of your larger bones, like the hip or the femur in your leg, blood cells are produced in a spongy material called marrow.

If your doctor suspects that there are problems with your blood, you may undergo a bone marrow biopsy. This test can single out both cancerous and noncancerous conditions like leukemia, anemia, infection, or lymphoma. The test is also used to check if cancer cells from another part of the body have spread to your bones.

Bone marrow is most easily accessed using a long needle inserted into your hipbone. This may be done in a hospital or doctor's office. The insides of your bones cannot be numbed, so some people feel a dull pain during this procedure. Others, however, only feel an initial sharp pain as the local anesthetic is injected.

Endoscopic biopsy

Endoscopic biopsies are used to reach tissue inside the body in order to gather samples from places like the bladder, colon, or lung.

During this procedure, your doctor uses a flexible thin tube called an endoscope. The endoscope has a tiny camera and a light at the end. A video monitor allows your doctor to view the images. Small surgical tools are also inserted into the endoscope. Using the video, your doctor can guide these to collect a sample.

The endoscope can be inserted through a small incision in your body, or through any opening in the body, including the mouth, nose, rectum, or urethra. Endoscopies normally take anywhere from five to 20 minutes.

This procedure can be done in a hospital or in a doctor's office. Afterward, you might feel mildly uncomfortable, or have bloating, gas, or a sore throat. These will all pass in time, but if you are concerned, you should contact your doctor.

Needle biopsies

Needle biopsies are used to collect skin samples, or for any tissue that is easily accessible under the skin. The different types of needle biopsies include the following:

Core needle biopsies use medium-sized needle to extract a column of tissue, in the same way that core samples are taken from the earth.

Fine needle biopsies use a thin needle that is attached to a syringe, allowing fluids and cells to be drawn out.

Image-guided biopsies are guided with imaging procedures — such as X-ray or CT scans — so your doctor can access specific areas, such as the lung, liver, or other organs.

Vacuum-assisted biopsies use suction from a vacuum to collect cells.

Skin biopsy

If you have a rash or lesion on your skin which is suspicious for a certain condition, does not respond to therapy prescribed by your doctor, or the cause of which is unknown, your doctor may perform or order a biopsy of the involved area of skin. This can be done by using local anesthesia and removing a small piece of the area with a razor blade, a scalpel, or a small, circular blade called a "punch." The specimen will be sent to the lab to look for evidence of conditions such as infection, cancer, and inflammation of

the skin structures or blood vessels.

Surgical biopsy

Sometimes a patient may have an area of concern that cannot be safely or effectively reached using the methods described above or the results of other biopsy specimens have been negative. An example would be a tumor in the abdomen near the aorta. In this case, a surgeon may need to get a specimen using a laparoscope or by making a traditional incision.

RISKS

The risks of a biopsy

Any medical procedure that involves breaking the skin carries the risk of infection or bleeding. However, as the incision is small, especially in needle biopsies, the risk is much lower.

How to prepare for a biopsy?

Biopsies may require some preparation on the part of the patient such as bowel prep, clear liquid diet, or nothing by mouth. Your doctor will instruct you on what to do before the procedure.

As always before a medical procedure, tell your doctor what medications and supplements you take. You may need to stop taking certain drugs before a biopsy, such as aspirin or nonsteroidal anti-inflammatory medications.

Following up after a biopsy

After the tissue sample is taken, your doctors will need to analyze it. In some cases, this analysis can be done at the time of procedure. More often, however, the sample will need to be sent to a laboratory for testing. The results can take anywhere from a few days to a few weeks.

Once the results arrive, your doctor may call you to share the results, or ask you to come in for a follow-up appointment to discuss the next steps.

If the results showed signs of cancer, your doctor should be able to tell the cancer's type and level of aggression from your biopsy. If your biopsy was done for a reason other than cancer, the lab report should be able to guide your doctor in diagnosing and treating that condition.

If the results are negative but the doctor's suspicion is still high either for cancer or other conditions, you may need another biopsy or a different type of biopsy. Your doctor will be able to guide you as to the best course to take. If you have any questions about the biopsy prior to the procedure or about the results, don't hesitate to talk with your doctor. You may want to write down your questions and bring them with you to your next office visit.

Chest Drain Management

Chest drains also known as under water sealed drains (UWSD) are inserted to allow draining of the pleural spaces of air, blood or fluid, allowing expansion of the lungs and restoration of negative pressure in the thoracic cavity. The underwater seal also prevents backflow of air or fluid into the pleural cavity. Appropriate chest drain management is required to maintain respiratory function and haemodynamic stability. Chest drains may be placed routinely in theatre, PICU and NICU; or in the emergency department and ward areas in emergency situations.

Definition of terms

Chylothorax: Collection of lymph fluid in the pleural space

Haemothorax: Collection of blood in the pleural space

Pneumothorax: Collection of air in the pleural space

Tension Pneumothorax: One way valve effect which allows air to enter the pleural space, but not leave. Air builds up and forces a mediastinal shift. This leads to decreased venous return to the heart and lung collapse/compression causing acute life-threatening respiratory and cardiovascular compromise. Ventilated patients are particularly high risk due to the positive pressure forcing more air into the pleural space. Tension pneumothorax can result in rapid clinical deterioration and is an emergency situation

Pleural effusion: Exudate or transudate in the pleural space

Under Water Seal Drain (UWSD): Drainage system of 3 chambers consisting of a water seal, suction control and drainage collection chamber. UWSD are designed to allow air or fluid to be removed from the pleural cavity, while also preventing backflow of air or fluid into the pleural space

Flutter valve (e.g. Pneumostat, Heimlich valve): One way valve system that is small and portable for transport or ambulant patients. Allows air or fluid to drain, but not to backflow into pleural cavity.

Indications for Insertion of a Chest Drain

Post operatively e.g. cardiac surgery, thoracotomy

Pneumothorax

Haemothorax

Chylothorax

Pleural effusions

Insertion of a Chest Drain

(See the Chest Drain (Intercostal Catheter) Insertion Clinical Practice Guideline).

RCH access only:

Chest Drain Set Up

Perform Hand Hygiene

Open drain packaging in an aseptic, 'no-touch' manner

Prepare drain as per manufacturer's instructions

Pass sterile end of tubing to Doctor inserting drain when they are ready

Apply suction to drain if ordered

Secure drain and tubing and patient

Secure all connections with cable ties

Perform hand hygiene

Management

Chest drains should not be clamped unless ordered by medical staff

There is a risk of the patient developing a tension pneumothorax if a drain is clamped while an air leak is present

Start of shift checks

Patient assessment

Chest drain assessment

Equipment

Ensure that Chest Drain is recorded in the EMR under the LDA flowsheet

Other considerations e.g physiotherapy referral

Patient Assessment

Vital signs

PICU and NICU patients should be on continuous monitoring

HR, SpO2, BP, RR

Routine observations:

For ward areas:

On insertion of chest drain monitor patient observations of HR, SpO2, BP, RR:

15 minutely for 1 hour

1 hourly for 4 hours

Includes HR, SpO2, BP, RR, Respiratory Effort and temperature

1-4 hourly as indicated by patient condition

Observations to be recorded in the Observation Flowsheet on EMR

Pain

Chest tubes are painful as the parietal pleura is very sensitive. Patients require regular pain relief for comfort, and to allow them to complete physiotherapy or mobilis

Pain assessment should be conducted frequently and documented in EMR

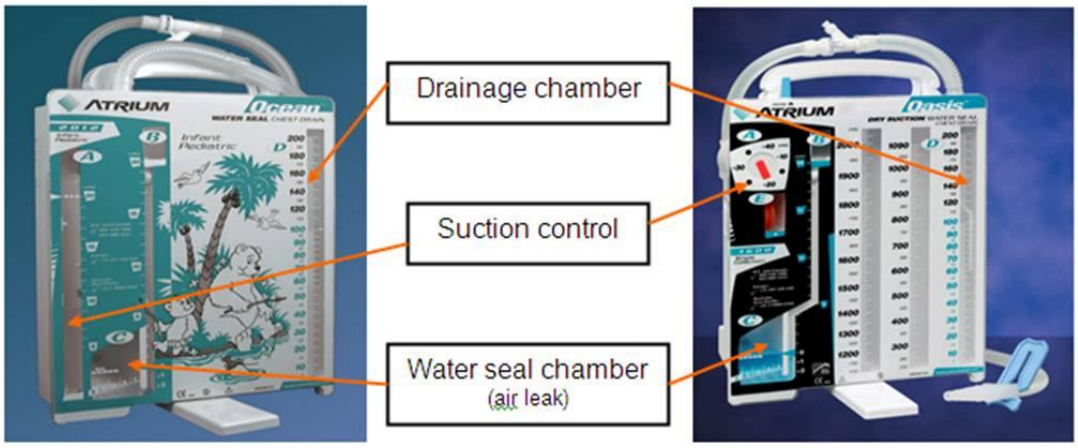
Drain insertion site

Observe for signs of infection and inflammation and document findings in EMR

Check dressing is clean and intact

Observe sutures remain intact and secure (particularly long term drains where sutures may erode over time)

Chest drain system



UWSD Unit and tubing

Never lift drain above chest level

The unit and all tubing should be below patient's chest level to facilitate drainage

Tubing should have no kinks or obstructions that may inhibit drainage

Ensure all connections between chest tubes and drainage unit are tight and secure

Connections should have cable ties in place

Tubing should be anchored to the patient's skin to prevent pulling of the drain

In PICU and NICU tubing should also be secured to patient bed to prevent accidental removal

Ensure the unit is securely positioned on its stand or hanging on the bed

Ensure the water seal is maintained at 2cm at all times

Suction

Suction is not always required, and may lead to tissue trauma and prolongation of an air leak in some patients

If suction is required orders should be written by medical staff

Atrium Oasis- The wall suction should be set at >80mmHg or higher

Atrium Ocean- Suction needs to be titrated so that the fluid in suction chamber is gently bubbling

Suction on the Drainage unit should be set to the prescribed level

-5 cmH20 is commonly used for neonates

-10 cmH20 to -20 cmH20 is usually used by convention for children

To check suction:

Atrium Oasis UWSD:

The bellows should be out to the '?' mark @ 20 cmH20

Any visible expansion of the bellows is adequate for suction <20 cmH20

If the bellows deflate, check the wall suction is still working, set to > 80mmHg and that the suction tubing is not kinked

Atrium Ocean UWSD:

The water level in the suction chamber should be at prescribed level and gentle bubbling should be observe

The level may drop due to evaporation or over-vigorous bubbling, if this occurs top fluid level up as per manufacturer's instructions

Drainage

Milking of chest drains is only to be done with written orders from medical staff. Milking drains creates a high negative pressure that can cause pain, tissue trauma and bleeding

Volume

Document hourly the amount of fluid in the drainage chamber in the Fluid Balance flowsheet on EMR

Calculate and document total hourly output if multiple drains

Calculate and document cumulative total output

Notify medical staff if there is a sudden increase in amount of drainage

Greater than 5mls/kg in 1 hour

Greater than 3mls/kg consistently for 3 hours

Blocked drains are a major concern for cardiac surgical patients due to the risk of cardiac tamponade

Notify medical staff if a drain with ongoing loss suddenly stops draining

If the chamber tips over and blood has spilt into next chamber, simply tip the chamber up to allow blood to flow to original chamber

Colour and Consistency

Monitor the colour/type of the drainage. If there is a change eg. Haemoserous to bright red or serous to creamy, notify medical staff.

Air Leak (bubbling)

An air leak will be characterised by intermittent bubbling in the water seal chamber when the patient with a pneumothorax exhales or coughs

The severity of the leak will be indicated by numerical grading on the UWSD (1-small leak 5-large leak)

Continuous bubbling of this chamber indicates large air leak between the drain and the patient. Check drain for disconnection, dislodgement and loose connection, and assess patient condition. Notify medical staff immediately if problem cannot be remedied.

Document on Fluid Balance Flowsheet on EMR

Oscillation (swing)

The water in the water seal chamber will rise and fall (swing) with respirations. This will diminish as the pneumothorax resolves.

Watch for unexpected cessation of swing as this may indicate the tube is blocked or kinked

Cardiac surgical patients may have some of their drains in the mediastinum in which case there will be no swing in the water seal chamber.

Document on Fluid Balance Flowsheet on EMR

Equipment by the bedside

Drain Clamps: At least 2 drain clamps per drain

For use in emergency only e.g. accidental disconnection

Two suction outlets: One for chest drain and one for airway management

Other Considerations

Referral to physiotherapist should be made to enhance chest movement and prevent a chest infection

Patient Positioning

Patients who are ambulant post operatively will have fewer complications and shorter lengths of stay. Consider converting to a portable flutter valve system such as the pneumostat to facilitate this. If chest drain will be required for prolonged period

If a patient is on strict bed rest or is an infant, regular changes in position should be encouraged to promote drainage, unless clinical condition prevents doing so

Patient Transport

If the patient needs to be transferred to another department or is ambulant, the suction should be disconnected and left open to air.

DO NOT CLAMP THE TUBE

Clamps must not be used on the patient for transport because of the risk of tension pneumothorax

Ensure the chamber is below the patient's chest level during transport

Flutter Valve systems (pneumostat, Heimlich) may be used for patient interhospital transfers (e.g. NETS and PETS)

Specimen Collection

Collect drainage specimens for culture through the needless sampling port located by the in line connector.

Equipment Required

Specimen container

Alcohol swab

10ml syringe

Dressing pack

Gloves

Eye Protection

Procedure:

Wait for the fluid to collect in a loop of the tubing

Perform hand hygiene, then don gloves & eye protection

Clean the sampling port, or for smaller sampling volumes you can use the patient tube, with an alcohol wipe and leave to dry for 20 seconds

Clamp the tubing above where the fluid has collected

Connect a 10ml Luer lock syringe to the sampling port and aspirate the fluid out of the tubing. If using the patient tube clamp the tubing then use a 20 gauge needle with syringe to aspirate specimen.

Place fluid in sterile specimen container

Once the syringe is disconnected remove all clamps and kinks

Perform hand hygiene

Chest Drain Dressings

Dressings should be changed if:

no longer dry and intact, or signs of infection e.g. redness, swelling, exudate

Infected drain sites require daily changing, or when wet or soiled

No evidence for routine dressing change after 3 or 7 days

This procedure is a risk for accidental drain removal so avoid unnecessary dressing changes

Exact type of dressing may depend on treating medical team

For cardiac surgical patients with drains inserted intraoperatively:

ensure dressing does not communicate with sternotomy dressing or wound

Sandwich drain between occlusive dressing

If site oozing dress with split gauze and occlusive dressing

For all other chest drains:

Sandwich between occlusive dressing

Allows site visibility and prevents pressure on skin

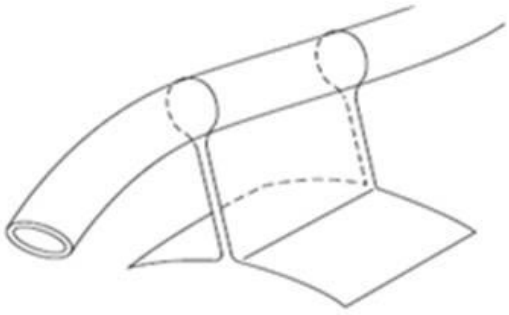
If site oozing dress with split gauze and occlusive dressing

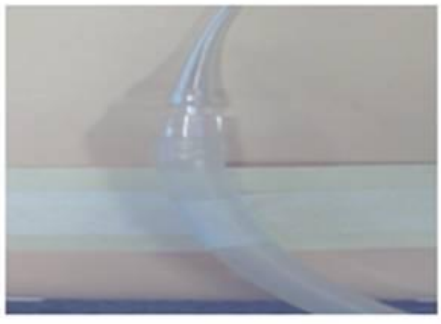
Ensure drain is secure

To prevent it falling out use a 'tag' of tape to secure to skin

Apply ComfeelTM or similar to protect fragile skin from 'tag' of tape: or,

Use a securement device such as a grip-lockTM to secure the drains to the skin





Removal of Dressings

To remove dressing when placed flat against the skin

Lift corner from the skin and slowly stretch the in dressing in a motion that is parallel to the skin

To remove semi permeable dressing placed in a sandwich position

Hold the corners of the dressing on either side of the drain and pull them away from each other; this should create a pocket around the drain

Peel each of the dressings away from each other until you reach patient skin

Slowly stretch the rest of the pressing in a motion that is parallel to the patient's skin to remove the rest of the dressing.

Changing the Chamber

Indications

The chest drain chamber needs to be replaced when it is ¾ full or when the UWSD system sterility has been compromised eg. Accidental disconnection.

Equipment Required

New UWSD

Dressing pack

Gloves

Eye Protection

Procedure

Perform hand hygiene

Use personal protective equipment to protect from possible body fluid exposure

Using an aseptic technique, remove the unit from packaging and place adjacent to old chamber

Prepare the new UWSD as per manufacturer's directions supplied with drain

Ensure patients drain is clamped to prevent air being sucked back into chest

Disconnect old chamber by holding down the clip on the in line connector to pull the tubing away from the chamber.

Insert the tubing into the new chamber until you hear it click.

Unclamp the chest drain

Check drain is back on suction

Place old chamber into yellow infectious waste bag and tie

Perform hand hygiene

Splitting the UWSD Chambers

Indications

When 2 chest drains are connected via a Y-connector into 1 drainage chamber there may be a need to have them split into 2 chambers to determine if 1 drain is draining more than the other

Equipment Required

New UWSD

Dressing pack

Gloves

Eye Protection

Chlorhexidine

Scissors

Connector

Cable tie wraps

Cable tie gun

Procedure:

Perform hand hygiene

Use personal protective equipment to protect from possible body fluid exposure

Place newly prepared drainage system in a position adjacent to the old system as set up as per chest drain set up.

Clamp all tubing

Cut the tie wraps with the Pliers

Remove the Y connector and attached tubing

Clean ends of exposed drains And wait 20 seconds

Attach drainage system to chest drain

Repeat with second chamber

Place tie wraps around connection site and pull to tighten

Tighten further using Cable tie Gun

Once secure remove clamps and check for signs suction has returned

Removal of Chest Drains

There must be a written order by medical staff in EMR

Indications

Absence of an air leak (pneumothorax)

Drainage diminishes to little or nothing

No evidence of respiratory compromise

Chest x-ray showing lung re-expansion

Equipment required

Dressing trolley with Yellow Infectious waste bag attached

Dressing pack (sterile towel, sterile gauze)

Sterile Gloves

Steristrips

Suture Cutter

Band Aids

Normal Saline

Clamps

Eye Protection

Occlusive dressing

Sharps container

Appropriate skin cleaning solution for procedure

Neonates <1500 grams- Chlorhexidine irrigation solution 0.1% (Blue Solution)

For all other patients- Aqueous Chlorhexidine 0.15% w/v cetrimide 15% (Yellow Solution)

Patient preparation

Ensure Patient is fasted, has been administered adequate pain control, sedation and distraction therapy (see procedural sedation guideline http://www.rch.org.au/rchcpg/hospital_clinical_guideline_index/Procedural_Pain_Management/)

Consider environment i.e. treatment room, privacy screens if in ward area etc

Heparin infusions for cardiac patients should not be discontinued prior to drain removal

Procedure

Perform hand hygiene

Opening dressing pack and add sterile equipment and 0.9% saline

disposable gloves

Remove all dressings around the area

Clamp drain tubing

If there are multiple drains insitu, clamp all drains before removal. Once the required drains are removed, unclamp remaining drains

Remove disposable gloves, perform hand hygiene and don sterile gloves

Place sterile towel under tubes

Clean around catheter insertion site and 1-2cm of the tubing with age appropriate skin cleaning solution

If purse string present (cardiac patients) unwind in preparation for assistant to tie

Remove suture securing drain (ensuring purse string suture not cut)

Instruct patient exhale and hold if they are old enough to cooperate; if not, time removal with exhalation as best as possible.

Pinching the edges of the skin together, remove the drain using smooth, but fast, continuous traction.

The assistant pulls purse string suture closed as soon as the drain is removed, tying 2 knots and ensuring the suture is not pulled too tight. Cut tails of suture about 2cm from knot

If there is no purse string present remove drain and quickly seal hole with occlusive dressing

Instruct patient to breathe normally again

Apply occlusive dressing (bandaid for cardiac children) over site

Remove and discard equipment into a yellow infectious waste bag and tie

Perform hand hygiene

Post Procedure Care

Attend to patients comfort and sedation score as per procedural sedation guideline

CXR should be performed post drain removal

Patients in PICU may wait until routine daily CXR if clinically well

Clinical status is the best indicator of reaccumulation of air or fluid. CXR should be performed if patient condition deteriorates

Monitor vital signs closely (HR, SpO2, RR and BP) on removal and then every hour for 4 hours post removal, and then as per clinical condition

Document the removal of drain in the LDA flowsheet in EMR

Remove sutures 5 days post drain removal

Dressing to remain insitu for 24 hours post removal unless contaminated

Complications post drain removal include pneumothorax, bleeding and infection of the drain site

Complications and Troubleshooting

Pneumothorax

Signs and symptoms include: Decreased SpO2, increased WOB, diminished breath sounds, decreased chest movement, complaints of chest pain, tachycardia or bradycardia, hypotension

Notify medical staff

Request urgent CXR

Ensure drain system is intact with no leaks, or blockages such as kinks or clamps

Prepare for insertion/ repositioning of chest drain

Bleeding at the drain site

Don gloves

Apply pressure to insertion site

Place occlusive dressing over site

Notify medical staff

Check Coagulation results

Check drain chamber to ensure no excessive blood loss

Infection of insertion site

Notify medical staff

Swab wound site

Consider blood cultures

Accidental disconnection of system

Clamp the drain tubing at the patient end. Clean ends of drain and reconnect. Ensure all connections are

cable tied. If a new drainage system is needed cover the exposed patient end of the drain with sterile dressing while new drain is setup. Ensure clamp removed when problem resolved

Check vital signs

Alert medical staff

Accidental drain removal

Apply pressure to the exit site and seal with steri-strips. Place an occlusive dressing over the top

Check vital signs

Alert medical staff.

A VHIMS must be completed by the patient nurse.

Purse string cut or not present

Small bore drains such as pigtails do not require purse strings. Simply apply an occlusive dressing.

For large bore drains:

Pinch or apply pressure to the exit site

Apply steri-strips to close exit site and cover with an occlusive dressing

Notify the responsible medical team to review patient and consider need for a suture

A VHIMS must be completed by the nurse delegated to remove the drain.

Unable to remove chest drain

If the drain is unable to be removed with reasonable traction being applied, notify the responsible medical team

Retained drain during removal

If the tube fractures during drain removal and remnants of the tubing is left within the patient contact the treating team

A chest x-ray should be conducted as soon as possible.

The patient should be prepared for theatre

The whole drain unit should be kept in the patient's room until surgical review and will need to be kept for collection to enable quality review.

The piece of drain tubing that remains in the patient will also be kept once surgically removed to allow for appropriate follow up of the incidents cause.

A VHIMS must be completed by the nurse delegated to remove the drain.

Lumbar puncture (spinal tap):

A lumbar puncture (spinal tap) is performed in your lower back, in the lumbar region. During a lumbar puncture, a needle is inserted between two lumbar bones (vertebrae) to remove a sample of cerebrospinal fluid. This is the fluid that surrounds your brain and spinal cord to protect them from injury.

A lumbar puncture can help diagnose serious infections, such as meningitis; other disorders of the central nervous system, such as Guillain-Barre syndrome and multiple sclerosis; or cancers of the brain or spinal cord. Sometimes doctors use lumbar punctures to inject anesthetic medications or chemotherapy drugs into the cerebrospinal fluid.

Why it's done?

A lumbar puncture may be done to:

Collect cerebrospinal fluid for laboratory analysis

Measure the pressure of your cerebrospinal fluid

Inject spinal anesthetics, chemotherapy drugs or other medications

Inject dye (myelography) or radioactive substances (cisternography) into cerebrospinal fluid to make diagnostic images of the fluid's flow

Information gathered from a lumbar puncture can help diagnose:

Serious bacterial, fungal and viral infections, including meningitis, encephalitis and syphilis

Bleeding around the brain (subarachnoid hemorrhage)

Certain cancers involving the brain or spinal cord

Certain inflammatory conditions of the nervous system, such as multiple sclerosis and Guillain-Barre syndrome.

Risks

Though lumbar punctures are generally recognized as safe, they do carry some risks. These include:

Post-lumbar puncture headache. Up to 25 percent of people who have undergone a lumbar puncture develop a headache afterward due to a leak of fluid into nearby tissues.

The headache typically starts several hours up to two days after the procedure and may be accompanied by nausea, vomiting and dizziness. The headaches are usually present when sitting or standing and resolve after lying down. Post-lumbar puncture headaches can last from a few hours to a week or more.

Back discomfort or pain. You may feel pain or tenderness in your lower back after the procedure. The pain might radiate down the back of your legs.

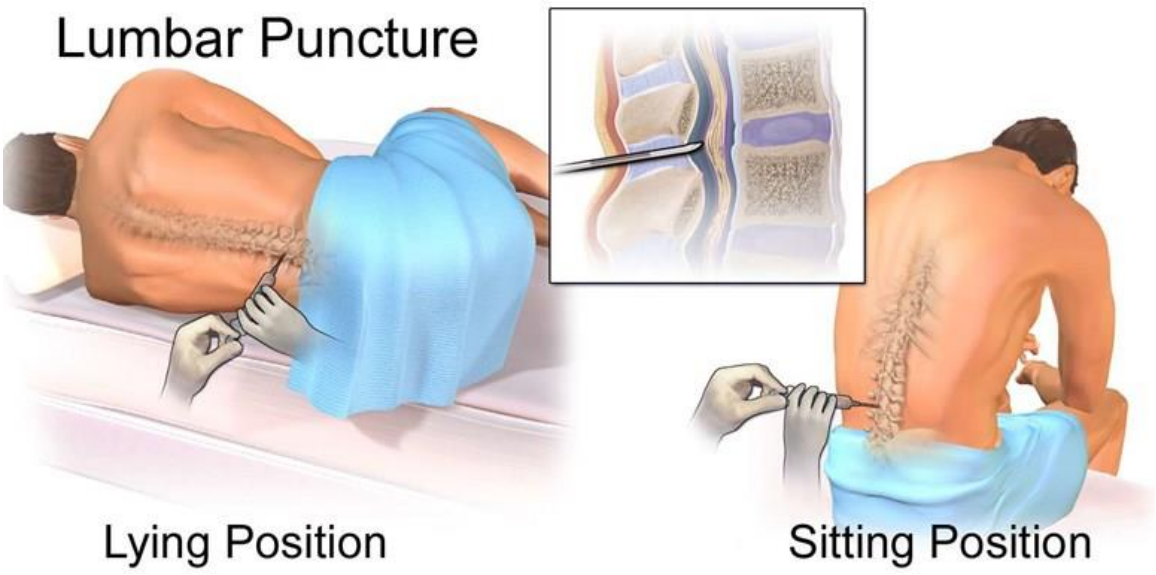
Bleeding. Bleeding may occur near the puncture site or, rarely, into the epidural space.

Brainstem herniation. Increased pressure within the skull (intracranial), due to a brain tumor or other space-occupying lesion, can lead to compression of the brainstem after a sample of cerebrospinal fluid is removed.

A computerized tomography (CT) scan or MRI prior to a lumbar puncture can be obtained to determine if there is evidence of a space-occupying lesion that results in increased intracranial pressure. This complication is rare.

How you prepare

Before your lumbar puncture, your doctor asks questions about your medical history, does a physical exam, and orders blood tests to check if you have any bleeding or clotting disorders. Your doctor may also recommend a CT scan or MRI to determine if you have any abnormal swelling in or around your brain.



Are there any side-effects or risks from a lumbar puncture?

Some people develop a headache after the test. This usually goes after a few hours. It is best to lie down for a few hours after the test, as this makes a headache less likely to develop. Other problems are rare - for example, infection or bleeding of the site of the needle entry. Any damage to the spinal cord or brain as a result of lumbar puncture is rare.

Removing Stitches

Facts on Removing Stitches

Among the many methods for closing wounds of the skin, stitching, or suturing, is the most common form of repairing a wound. Other methods include surgical staples, skin closure tapes, and adhesives.

Removing stitches or other skin-closure devices is a procedure that many people dread. Understanding the various skin-closure procedures and knowing how they are put in and what to expect when they are removed can help overcome much of this anxiety.

Stitches (also called sutures) are used to close cuts and wounds in skin. They can be used in nearly every part of the body, internally and externally. Doctors literally "sew" the skin together with individual sutures and tie a secure knot. Stitches then allow the skin to heal naturally when it otherwise may not come together.

Stitches are used to close a variety of wound types. Accidental cuts or lacerations are often closed with stitches. Also, surgeons use stitches during operations to tie ends of bleeding blood vessels and to close surgical incisions.

Sutures are divided into two general categories, namely, absorbable and nonabsorbable.

Absorbable sutures rapidly break down in the tissues and lose their strength within 60 days. This type of suture does not have to be removed. These are used to close skin and for other internal uses where a permanent stitch is not needed.

Nonabsorbable sutures, on the other hand, maintain their strength for longer than 60 days. These sutures are used to close skin, external wounds, or to repair blood vessels, for example. They may require removal depending on where they are used, such as once a skin wound has healed.

The general technique of placing stitches is simple. The "thread" or suture that is used is attached to a needle. The wound is usually cleaned with sterile water and peroxide. Betadine, an antiseptic solution, is used to cleanse the area around the wound. Next, the area is numbed with an anesthetic agent such as lidocaine (Xylocaine). Then the needle with the thread attached is used to "sew" the edges of the wound together, in an effort to recreate the original appearance. Several stitches may be needed to accomplish this. Once the wound is closed a topical antibiotic gel is often spread over the stitches and a bandage is initially applied to the wound. All sutured wounds that require stitches will have scar formation, but the scarring is usually minimal.

Surgical staples are also useful for closing many types of wounds. Staples have the advantage of being quicker and may cause fewer infections than stitches. Disadvantages of staples are permanent scars if used inappropriately and imperfect aligning of the wound edges, which can lead to improper healing. Staples are used on scalp lacerations and commonly used to close surgical wounds.

Skin closure tapes, also known as adhesive strips, have recently gained popularity. The advantages of

skin closure tapes are plenty. The rate of wound infection is less with adhesive strips than with stitches. Also, it takes less time to apply skin closure tape. For many people, there is no need for a painful injection of anesthetic when using skin closure tapes. Disadvantages of using skin closure tapes include less precision in bringing wound edges together than suturing. Not all areas of the body can be taped. For example, body areas with secretions such as the armpits, palms, or soles are difficult areas to place adhesive strips. Areas with hair also would not be suitable for taping.

Adhesive agents can also be used to close a wound. This material is applied to the edges of the wound somewhat like glue and should keep the edges of the wound together until healing occurs. Adhesive glue is the newest method of wound repair and is becoming a popular alternative to stitches, especially for children. The adhesive simply falls off or wears away after about 5-7 days.

Removing Stitches Preparation

If a person has received stitches, they should be given instructions for taking care of the stitches and wound, and be given an approximate date to have the stitches removed. A sample of such instructions is as follows:

Keep wound clean and dry for the first 24 hours.

Showering is allowed after 48 hours, but do not soak the wound.

Bandages can safely be removed from the wound after 48 hours, unless the wound continues to bleed or has a discharge. If bandages are kept in place and get wet, the wet bandage should be replaced with a clean dry bandage.

An antibiotic ointment (brand names are Polysporin or Neosporin, for example) should be used after the wound is cleaned.

Notify the doctor if a suture loosens or breaks.

When scheduled to have the stitches removed, be sure to make an appointment with a person qualified to remove the stitches.

Different parts of the body require suture removal at varying times. Common periods of time for removal are as follows, but times vary according to the health care professionals that perform the procedure:

Face: 3-5 days

Scalp: 7-10 days

Trunk: 7-10 days

Arms and legs: 10-14 days

Joints: 14 days

Sutures may be taken out all at one visit, or sometimes, they may be taken out over a period of days if the wound requires it.

During Removing Stitches Procedure

The wound is cleaned with an antiseptic to remove encrusted blood and loosened scar tissue.

Sterile forceps (tongs or pincers) are used to pick up the knot of each suture, and then surgical scissors or a small knife blade is used to cut the suture. Forceps are used to remove the loosened suture and pull the thread from the skin.

These relatively painless steps are continued until the sutures have all been removed. You may feel a tug or slight pull as a stitch is removed.

The wound is cleansed again.

Adhesive strips are often placed over the wound to allow the wound to continue strengthening.

Removing staples

Staple removal is also a simple procedure and is similar to suture removal. Doctors use a special instrument called a staple remover.

After cleansing the wound, the doctor will gently back out each staple with the remover. The doctor applies pressure to the handle, which bends the staple, causing it to straighten the ends of the staple so that it can easily be removed from the skin. The staple backs out of the skin the very same direction in which it was placed. People may feel a pinch or slight pull.

The process is repeated until all staples are removed. The wound is cleansed a second time, and adhesive strips are applied. This is also a relatively painless procedure.

After Removing Stitches Procedure

Wound care after suture removal is just as important as it was prior to removal of the stitches. Take good care of the wound so it will heal and not scar.

Keep adhesive strips on the wound for about 5 days. Then soak them for removal. Do not peel them off.

Continue to keep the wound clean and dry.

Skin regains tensile strength slowly. At the time of suture removal, the wound has only regained about 5%-10% of its strength. Therefore, protect the wound from injury during the next month.

Injured tissue also requires additional protection from sun's damaging ultraviolet rays for the next several months. The use of sunscreen during this period of healing is advised for those areas that are exposed.

The use of vitamin E topically has also been suggested to be helpful in the healing process of the

damaged skin. This should only be considered once the skin edges are healed and are closed together.

When to Seek Medical Care after Stitches Removal

If the following signs of infection adjacent to the sutures are present,

Redness

Increasing pain

Swelling

Fever

Red streaks progressing away from the sutured site

Material coming from out of the wound.

Inhaler devices for respiratory medicines

Inhalers for chronic obstructive pulmonary disease (COPD) and asthma are devices which deliver medicine to prevent and control symptoms and help reduce exacerbations (flare ups). The variations between different inhaler devices can sometimes be confusing, but understanding them will help you make an informed choice about your care.

Why are there different types of inhalers?

- Inhalers are classified generally as
- pressurised metered-dose inhalers (pMDIs)
- breath-actuated metered dose inhalers (bMDIs)
- dry powder inhalers (DPIs, single or multidose), and
- soft mist inhalers.

Inhalers can contain either a single medication or a combination of medications.

An inhaler can deliver:

- a bronchodilator, which helps to open up your airways and increase air flow
- a corticosteroid, which helps to reduce inflammation in your airways
- a combination of different bronchodilators
- a combination of bronchodilator and corticosteroid

Which is better?

The choice of inhaler device depends on a number of considerations. The type of inhaler or other device you use will depend on the medicine you are taking and your ability to use the device properly, as well as your own personal preference – so that you get the most benefit from your inhaled medicines.

Are you physically capable of carrying out each step of the inhaler technique correctly?

For example:

- are you able to coordinate breathing in with pressing the inhaler at the same time?
- are you able to form a good seal with your lips over the mouthpiece?
- are you able to open, correctly handle, and prepare (prime) the device?
- are you able to take a deep breath to inhale the medicine?

Can you remember all the necessary steps to use the inhaler correctly, and to remember when to take their inhaler?

Using your inhaler and devices such as spacers correctly is very important in order to ensure that the right amount of medicine is delivered to your lungs and to help minimize side effects.

References

1. Price D, Bosnic-Anticevich S, Briggs A, et al. Inhaler competence in asthma: Common errors, barriers to use and recommended solutions. Respir Med 2013;107:37-46 [PubMed].

Inhaler :

An inhaler (puffer or pump) is a medical device used for delivering medication into the body via the lungs. It is mainly used in the treatment of asthma and chronic obstructive pulmonary disease. Zanamivir, used to treat influenza, must be administered via inhaler.

To reduce deposition in the mouth and throat, and to reduce the need for precise synchronization of the start of inhalation with actuation of the device, MDIs are sometimes used with a complementary spacer or holding chamber device.

Types

Metered dose (MDI)

The most common type of inhaler is the pressurized metered-dose inhaler (MDI) which is made up of 3 standard components- a metal canister, plastic actuator, and a metering valve. H&T Presspart, based in

Blackburn, UK, provide over 75% of the world's can and actuator components to the pharmaceutical market. The metering valve is supplied by a number of companies including Aptar and Coster. In MDIs, medication is typically stored in solution in a pressurized canister that contains a propellant, although it may also be a suspension. The MDI canister is attached to a plastic, hand-operated actuator. On activation, the metered-dose inhaler releases a fixed dose of medication in aerosol form. The correct procedure for using an MDI is to first fully exhale, place the mouth-piece of the device into the mouth, and having just started to inhale at a moderate rate, depress the canister to release the medicine. The aerosolized medication is drawn into the lungs by continuing to inhale deeply before holding the breath for 10 seconds to allow the aerosol to settle onto the walls of the bronchittus and other airways of the lung. Some inhalers are made to act instantly in case of an asthma attack, and others are made to act later.

Dry powder (DPI)

Dry powder inhalers release a metered or device-measured dose of powdered medication that is inhaled through a DPI device.

A dry-powder inhaler (DPI) is a device that delivers medication to the lungs in the form of a dry powder. DPIs are commonly used to treat respiratory diseases such as asthma, bronchitis, emphysema and COPD although DPIs (such as inhalable insulin Afrezza) have also been used in the treatment of diabetes mellitus.

DPIs are an alternative to the aerosol-based inhalers commonly called metered-dose inhaler (or MDI). The DPIs may require some procedure to allow a measured dose of powder to be ready for the patient to take. The medication is commonly held either in a capsule for manual loading or a proprietary from inside the inhaler. Once loaded or actuated, the operator puts the mouthpiece of the inhaler into their mouth and takes a sharp, deep inhalation (ensuring that the medication reaches the lower parts of the lungs), holding their breath for 5–10 seconds. There are a variety of such devices. The dose that can be delivered is typically less than a few tens of milligrams in a single breath since larger powder doses may lead to provocation of cough.

Most DPIs rely on the force of patient inhalation to entrain powder from the device and subsequently break-up the powder into particles that are small enough to reach the lungs.For this reason, insufficient patient inhalation flow rates may lead to reduced dose delivery and incomplete deaggregation of the powder, leading to unsatisfactory device performance. Thus, most DPIs have a minimum inspiratory effort that is needed for proper use and it is for this reason that such DPIs are normally used only in older children and adults.

Lactose:

Some powder inhalers use lactose to:

Carry the fine particles of the active component (which must be fine to reach its target)

Improve the flow-ability of the powder during manufacturing and help handling

Act as a bulking agent

Aid in powder uptake from the device during inhalation and aerosolization

It has been suggested that such lactose may be harmful to lactose intolerant people,[3] and some doctors advise patients not to use lactose containing DPIs[4] to minimize the risk of hypersensitivity reactions

Storage:

DPI medication must be stored in a dry place in a temperature of not more than 25 °C (77 °F) and humidity between 40–50% in a sealed packaging, since exposure of the powder to moisture degrades the ability of the device to disperse its medication as a fine powder upon inhalation. Some medication also needs photo protection.

Nebulizers

Nebulizers — supply the medication as an aerosol created from an aqueous formulation.

Nebulizer is a drug delivery device used to administer medication in the form of a mist inhaled into the lungs. Nebulizers are commonly used for the treatment of cystic fibrosis, asthma, COPD and other respiratory diseases or disorders.

Analytical nebulizers are another form of nebulizer and are used primarily in laboratory settings for elemental analysis.

Nebulizers use oxygen, compressed air or ultrasonic power to break up solutions and suspensions into small aerosol droplets that can be directly inhaled from the mouthpiece of the device. An aerosol is a mixture of gas and solid or liquid particles.

Medical uses:

Guidelines

Various asthma guidelines, such as the Global Initiative for Asthma Guidelines [GINA], the British Guidelines on the management of Asthma, The Canadian Pediatric Asthma Consensus Guidelines, and United States Guidelines for Diagnosis and Treatment of Asthma each recommend metered dose inhalers in place of nebulizer-delivered therapies. The European Respiratory Society acknowledge that although nebulizers are used in hospitals and at home they suggest much of this use may not be evidence-based.

Effectiveness

Recent evidence show that nebulizers are no more effective than metered-dose inhalers (MDIs) with spacers.An MDI with a spacer may offer advantages to children who have acute asthma. Those findings refer specifically to the treatment of asthma and not to the efficacy of nebulisers generally, as for COPD for example.For COPD, especially when assessing exacerbations or lung attacks, there is no evidence to indicate that MDI (with a spacer) delivered medicine is more effective than administration of the same medicine with a nebulizer.

European Respiratory Society highlighted a risk relating to droplet size reproducibility caused by selling nebulizer devices separately from nebulized solution. They found this practice could vary droplet size 10-fold or more by changing from an inefficient nebulizer system to a highly efficient one.Two advantages attributed to nebulizers, compared to MDIs with spacers (inhalers), were their ability to deliver larger dosages at a faster rate, especially in acute asthma; however, recent data suggests actual lung deposition rates are the same. In addition, another trial found that a MDI (with spacer) had a lower required dose for clinical result compared to a nebulizer .

Aerosol deposition

The lung deposition characteristics and efficacy of an aerosol depend largely on the particle or droplet size. Generally, the smaller the particle the greater its chance of peripheral penetration and retention. However, for very fine particles below 0.5 μm in diameter there is a chance of avoiding deposition altogether and being exhaled. In 1966 the Task Group on Lung Dynamics, concerned mainly with the

hazards of inhalation of environmental toxins, proposed a model for deposition of particles in the lung. This suggested that particles of more than 10 μm in diameter are most likely to deposit in the mouth and throat, for those of 5–10 μm diameter a transition from mouth to airway deposition occurs, and particles smaller than 5 μm in diameter deposit more frequently in the lower airways and are appropriate for pharmaceutical aerosols.

Types of nebulizers

Mechanical

Soft mist inhaler

The medical company Boehringer Ingelheim also invented a new device named Respimat Soft Mist Inhaler in 1997. This new technology provides a metered dose to the user, as the liquid bottom of the inhaler is rotated clockwise 180 degrees by hand, adding a build up tension into a spring around the flexible liquid container. When the user activates the bottom of the inhaler, the energy from the spring is released and imposes pressure on the flexible liquid container, causing liquid to spray out of 2 nozzles, thus forming a soft mist to be inhaled. The device features no gas propellant and no need for battery/power to operate. The average droplet size in the mist was measured to a somewhat disappointing 5.8 micrometers, which could indicate some potential efficiency problems for the inhaled medicine to reach the lungs. Subsequent trials have proven this was not the case. Due to the very low velocity of the mist, the Soft Mist Inhaler in fact has a higher efficiency compared to a conventional pMDI.In 2000, arguments were launched towards the European Respiratory Society (ERS) to clarify/expand their definition of a nebulizer, as the new Soft Mist Inhaler in technical terms both could be classified as a "hand driven nebulizer" and a "hand driven pMDI".

Electrical

Jet nebulizer

The most commonly used nebulizers are jet nebulizers, which are also called "atomizers".Jet nebulizers are connected by tubing to a compressor, that causes compressed air or oxygen to flow at high velocity through a liquid medicine to turn it into an aerosol, which is then inhaled by the patient. Currently there seems to be a tendency among physicians to prefer prescription of a pressurized Metered Dose Inhaler (pMDI) for their patients, instead of a jet nebulizer that generates a lot more noise (often 60 dB during use) and is less portable due to a greater weight. However, jet nebulizers are commonly used for patients in hospitals who have difficulty using inhalers, such as in serious cases of respiratory disease, or severe asthma attacks.The main advantage of the jet nebulizer is related to its low operational cost. If the patient needs to inhale medicine on a daily basis the use of a pMDI can be rather expensive. Today several manufacturers have also managed to lower the weight of the jet nebulizer down to 635 grams (22.4 oz), and thereby started to label it as a portable device. Compared to all the competing inhalers and nebulizers, the noise and heavy weight is however still the biggest draw back of the jet nebulizer. Trade names for jet nebulizers include Maxin.

Ultrasonic wave nebulizer

Ultrasonic wave nebulizers were invented in 1964 as a new type of portable nebulizer. The technology inside an ultrasonic wave nebulizer is to have an electronic oscillator generate a high frequency ultrasonic wave, which causes the mechanical vibration of a piezoelectric element. This vibrating element is in contact with a liquid reservoir and its high frequency vibration is sufficient to produce a vapor mist.As they create aerosols from ultrasonic vibration instead of using a heavy air compressor, they only have a weight around 170 grams (6.0 oz). Another advantage is that the ultrasonic vibration is almost silent. Examples of these more modern type of nebulizers are: Omron NE-U17 and Beurer Nebulizer IH30.

Vibrating mesh technology

A new significant innovation was made in the nebulizer market around 2005, with creation of the ultrasonic Vibrating Mesh Technology (VMT). With this technology a mesh/membrane with 1000-7000 laser drilled holes vibrates at the top of the liquid reservoir, and thereby pressures out a mist of very fine droplets through the holes. This technology is more efficient than having a vibrating piezoelectric element at the bottom of the liquid reservoir, and thereby shorter treatment times are also achieved. The old problems found with the ultrasonic wave nebulizer, having too much liquid waste and undesired heating of the medical liquid, have also been solved by the new vibrating mesh nebulizers. Available VMT nebulizers include: Pari eFlow,Respironics i-Neb,Beurer Nebulizer IH50, and Aerogen Aeroneb.As the price of the ultrasonic VMT nebulizers is higher than models using previous technologies, most manufacturers continue to also sell the classic jet nebulizers.

Use and attachments

Nebulizers accept their medicine in the form of a liquid solution, which is often loaded into the device upon use. Corticosteroids and bronchodilators such as salbutamol (albuterol USAN) are often used, and sometimes in combination with ipratropium. The reason these pharmaceuticals are inhaled instead of ingested is in order to target their effect to the respiratory tract, which speeds onset of action of the medicine and reduces side effects, compared to other alternative intake routes.

Usually, the aerosolized medicine is inhaled through a tube-like mouthpiece, similar to that of an inhaler. The mouthpiece, however, is sometimes replaced with a face mask, similar to that used for inhaled anesthesia, for ease of use with young children or the elderly. Pediatric masks are often shaped like animals such as fish, dogs or dragons to make children less resistant to nebulizer treatments. Many nebulizer manufacturers also offer pacifier attachments for infants and toddlers. But mouthpieces are preferable if patients are able to use them since face-masks result in reduced lung delivery because of aerosol losses in the nose.

After use with corticosteroid, it is theoretically possible for patients to develop a yeast infection in the mouth (thrush) or hoarseness of voice (dysphonia), although these conditions are clinically very rare. To

avoid these adverse effects, some clinicians suggest that the person who used the nebulizer should rinse his or her mouth. This is not true for bronchodilators; however, patients may still wish to rinse their mouths due to the unpleasant taste of some bronchodilating drug

Nasal

Nasal inhalers contain decongestant drugs to relieve nasal congestion in the upper respiratory tract. The active ingredient in most decongestants is either pseudoephedrine or phenylephrine. Many are sold over-the-counter without a prescription.

Propellants

In 2009, the FDA banned the use of inhalers that use chlorofluorocarbons (CFC) as propellants. In their place, inhalers now use hydrofluoroalkane (HFA). HFA is not environmentally inert as it is a greenhouse gas but it does not affect the ozone layer. While some asthma sufferers and advocacy groups contend that HFA inhalers are not as effective, published clinical studies indicate CFC and HFA inhalers are equally effective in controlling asthma.

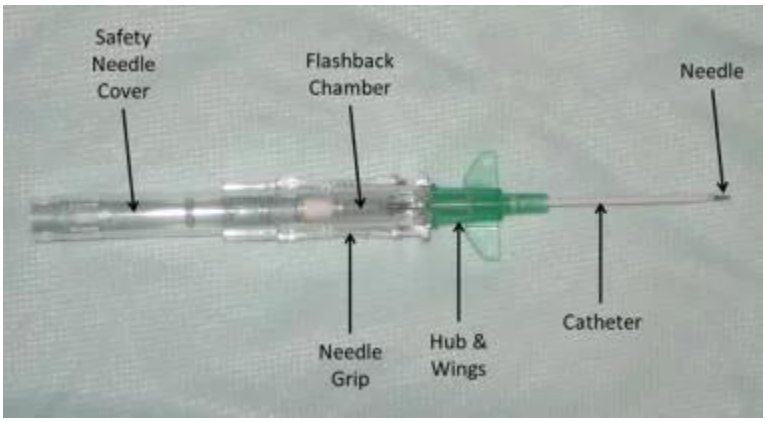
While the impact of CFCs from inhalers on the ozone layer had been minuscule (dwarfed by industrial processes using CFCs,) the FDA in its interpretation of the Montreal Protocol mandated the switch in propellants.Patients expressed concern about the high price of the HFA inhalers as there are no generic versions, whereas generic CFC inhalers had been available

Intravenous Cannulation

Intravenous (IV) cannulation is a technique in which a cannula is placed inside a vein to provide venous access. Venous access allows sampling of blood, as well as administration of fluids, medications, parenteral nutrition, chemotherapy, and blood products.

Veins have a three-layered wall composed of an internal endothelium surrounded by a thin layer of muscle fibers that is surrounded by a layer of connective tissue. Venous valves encourage unidirectional flow of blood and prevent pooling of blood in the dependent portions of the extremities; they also can impede the passage of a catheter through and into a vein. Venous valves are more numerous just distal to the points were tributaries join larger veins and in the lower extremities.

The placement of an over-the-needle IV catheter, in which the catheter is mounted on the needle (see the first image below). Such devices are available in various gauges (16-24 gauge), lengths (25-44 mm), compositions, and designs .



In general, it is advisable to select the smallest gauge of catheter that can still be effectively used to deliver the prescribed therapy; this will minimize the risk of damage to the vessel intima and ensure adequate blood flow around the catheter, which reduces the risk of phlebitis. However, if the situation is an emergency or if the patient is expected to require large volumes infused over a short period of time, the largest-gauge and shortest catheter that is likely to fit the chosen vein should be used.

Veins with high internal pressure become engorged and are easier to access. The use of venous tourniquets, dependent positioning, “pumping” via muscle contraction, and the local application of heat or nitroglycerin ointment can contribute to venous engorgement.

The superficial veins of the upper extremities are preferred to those of the lower extremities for peripheral venous access because cannulation of upper-extremity veins interferes less with patient mobility and poses a lower risk for phlebitis. It is easier to insert a venous catheter where two tributaries merge into a Y-shaped form. It is recommended to choose a straight portion of a vein to minimize the chance of hitting valves.

Indications

Indications for IV cannulation include the following:

Repeated blood sampling

IV administration of fluid

IV administration of medications

IV administration of chemotherapeutic agents

IV nutritional support

IV administration of blood or blood products

IV administration of radiologic contrast agents for computed tomography (CT), magnetic resonance imaging (MRI), or nuclear imaging

Contraindications

No absolute contraindications for IV cannulation exist.

Peripheral venous access in an injured, infected, or burned extremity should be avoided if possible.

Some vesicant and irritant solutions (pH <5, pH >9, or osmolarity >600 mOsm/L) can cause blistering and tissue necrosis if they leak into the tissue, including sclerosing solutions, some chemotherapeutic agents, and vasopressors. These solutions are more safely infused into a central vein. They should only be given through a peripheral vein in emergency situations or when a central venous access is not readily available.

Nasogastric intubation:

Nasogastric intubation is a medical process involving the insertion of a plastic tube (nasogastric tube or NG tube) through the nose, past the throat, and down into the stomach. Orogastric intubation is a similar process involving the insertion of a plastic tube (orogastric tube) through the mouth.

Uses:

A nasogastric tube is used for feeding and administering drugs and other oral agents such as activated charcoal. For drugs and for minimal quantities of liquid, a syringe is used for injection into the tube. For continuous feeding, a gravity based system is employed, with the solution placed higher than the patient's stomach. If accrued supervision is required for the feeding, the tube is often connected to an electronic pump which can control and measure the patient's intake and signal any interruption in the feeding.

Nasogastric aspiration (suction) is the process of draining the stomach's contents via the tube. Nasogastric aspiration is mainly used to remove gastrointestinal secretions and swallowed air in patients with gastrointestinal obstructions. Nasogastric aspiration can also be used in poisoning situations when a potentially toxic liquid has been ingested, for preparation before surgery under anaesthesia, and to extract samples of gastric liquid for analysis.

If the tube is to be used for continuous drainage, it is usually appended to a collector bag placed below the level of the patient's stomach; gravity empties the stomach's contents. It can also be appended to a

suction system, however this method is often restricted to emergency situations, as the constant suction can easily damage the stomach's lining. In non-emergency situations, intermittent suction is often applied giving the benefits of suction without the untoward effects of damage to the stomach lining.

Suction drainage is also used for patients who have undergone a pneumonectomy in order to prevent anesthesia-related vomiting and possible aspiration of any stomach contents. Such aspiration would represent a serious risk of complications to patients recovering from this surgery.

Types

Types of nasogastric tubes include:

Levin catheter, which is a single lumen, small bore NG tube. It is more appropriate for administration of medication or nutrition.

Salem Sump catheter, which is a large bore NG tube with double lumen. This avails for aspiration in one lumen, and venting in the other to reduce negative pressure and prevent gastric mucosa from being drawn into the catheter.

Dobhoff tube, which is a small bore NG tube with a weight at the end intended to pull it by gravity during insertion.

Technique:

Before an NG tube is inserted, it must be measured from the tip of the patient's nose, loop around their ear and then down to roughly 5 cm below the xiphoid process. The tube is then marked at this level to ensure that the tube has been inserted far enough into the patient's stomach. Many commercially available stomach and duodenal tubes have several standard depth markings, for example 18" (46 cm), 22" (56 cm), 26" (66 cm) and 30" (76 cm) from distal end; infant feeding tubes often come with 1 cm depth markings. The end of a plastic tube is lubricated (local anesthetic, such as 2% xylocaine gel, may be used; in addition, nasal vasoconstrictor and/or anesthetic spray may be applied before the insertion) and inserted into one of the patient's anterior nares. The tube should be directed straight towards the back of the patient as it moves through the nasal cavity and down into the throat. When the tube enters the oropharynx and glides down the posterior pharyngeal wall, the patient may gag; in this situation the patient, if awake and alert, is asked to mimic swallowing or is given some water to sip through a straw, and the tube continues to be inserted as the patient swallows. Once the tube is past the pharynx and enters the esophagus, it is easily inserted down into the stomach. The tube must then be secured in place to prevent it from moving.

Great care must be taken to ensure that the tube has not passed through the larynx into the trachea and down into the bronchi. The reliable method is to aspirate some fluid from the tube with a syringe. This fluid is then tested with pH paper (note not litmus paper) to determine the acidity of the fluid. If the pH is 4 or below then the tube is in the correct position. If this is not possible then correct verification of tube position is obtained with an X-ray of the chest/abdomen. This is the most reliable means of

ensuring proper placement of an NG tube. The use of a chest x-ray to confirm position is the expected standard in the UK, with Dr/ physician review and confirmation. Future techniques may include measuring the concentration of enzymes such as trypsin, pepsin, and bilirubin to confirm the correct placement of the NG tube. As enzyme testing becomes more practical, allowing measurements to be taken quickly and cheaply at the bedside, this technique may be used in combination with pH testing as an effective, less harmful replacement of X-ray confirmation. If the tube is to remain in place then a tube position check is recommended before each feed and at least once per day.

Only smaller diameter (12 Fr or less in adults) nasogastric tubes are appropriate for long-term feeding, so as to avoid irritation and erosion of the nasal mucosa. These tubes often have guide wires to facilitate insertion. If feeding is required for a longer period of time, other options, such as placement of a PEG tube, should be considered.

Function of an NG tube properly placed and used for suction is maintained by flushing. This may be done by flushing small amounts of saline and air using a syringe or by flushing larger amounts of saline or water, and air, and then assessing for the air to circulate through one lumen of the tube, into the stomach, and out the other lumen. When these two techniques of flushing were compared, the latter was more effective.

Contraindications:

The use of nasogastric intubation is contraindicated in patients with moderate-to-severe neck and facial fractures due to the increased risk of airway obstruction or improper tube placement. Special attention is necessary during insertion under these circumstances in order to avoid undue trauma to the esophagus. There is also a greater risk to patients suffering from bleeding disorders, particularly those resulting from the distended sub-mucosal veins in the lower third of the esophagus known as esophageal varices which may be easily ruptured due to their friability and also in GERD.

Alternative measures, such as an orogastric intubation, should be considered under these circumstances, or if the patient will be incapable of meeting their nutritional and caloric needs for an extended time period (usually >24 hours).

Complications:

Minor complications include nose bleeds, sinusitis, and a sore throat.

Sometimes more significant complications occur including erosion of the nose where the tube is anchored, esophageal perforation, damage to a surgical anastomosis, pulmonary aspiration, a collapsed lung, or intracranial placement of the tube.

Urinary catheterization:

In urinary catheterization a latex, polyurethane, or silicone tube known as a urinary catheter is inserted into a patient's bladder via the urethra. Catheterization allows the patient's urine to drain freely from the bladder for collection. It may be used to inject liquids used for treatment or diagnosis of bladder

conditions. A clinician, often a nurse, usually performs the procedure, but self-catheterization is also possible. The catheter may be a permanent one (indwelling catheter), or an intermittent catheter removed after each catheterization.

Catheter types:

Catheters come in several basic designs:

A Foley catheter (indwelling urinary catheter) is retained by means of a balloon at the tip that is inflated with sterile water. The balloons typically come in two different sizes: 5 cm3 and 30 cm3. They are commonly made in silicone rubber or natural rubber.

An intermittent catheter/Robinson catheter is a flexible catheter used for short term drainage of urine. Unlike the Foley catheter, it has no balloon on its tip and therefore cannot stay in place unaided. These can be non-coated or coated (e.g., hydrophilic coated and ready to use).

Intermittent self catheterization in males is best performed with a flexible catheter to drain the bladder periodically. The procedure should not be attempted by a patient without guidance in maintaining cleanliness of the catheter and surrounding area and specific instruction regarding catheter insertion from meatus to bladder entry.

A coudé catheter, including Tiemann's catheter, is designed with a curved tip that makes it easier to pass through the curvature of the prostatic urethra.

A hematuria (or haematuria) catheter is a type of Foley catheter used for Post-TURP hemostasis. This is useful following endoscopic surgical procedures, or in the case of gross hematuria. There are both two-way and three-way hematuria catheters (double and triple lumen).

An condom catheter is used for incontinent males and carries a lower risk of infection than an indwelling catheter.

Catheter diameters are sized by the French catheter scale (F). The most common sizes are 10 F (3.3mm) to 28 F (9.3mm). The clinician selects a size large enough to allow free flow of urine, and large enough to control leakage of urine around the catheter. A larger size is necessary when the urine is thick, bloody, or contains large amounts of sediment. Larger catheters, however, are more likely to damage the urethra. Some people develop allergies or sensitivities to latex after long-term latex catheter use making it necessary to use silicone or Teflon types.

Evidence does not support an important decrease in the risk of urinary tract infections when silver-alloy catheters are used.

Sex differences:

In males, the catheter tube is inserted into the urinary tract through the penis. A condom-type catheter (also known as a 'Texas catheter'), if used, fits around the tip of the penis, rather than being inserted. In females, the catheter is inserted into the urethral meatus, after a cleansing using povidone-iodine. The

procedure can be complicated in females due to varying layouts of the genitalia (due to age, obesity, female genital cutting, childbirth, or other factors), but a good clinician would rely on anatomical landmarks and patience when dealing with such a patient. In the UK it is generally accepted that cleaning the area surrounding the urethral meatus with 0.9% sodium chloride solution is sufficient for both male and female patients as there is no reliable evidence to suggest that the use of antiseptic agents reduces the risk of urinary tract infection.

Males may have a slightly higher incidence of bladder spasms. If bladder spasms occur, or there is no urine in the drainage bag, the catheter may be blocked by blood, thick sediment, or a kink in the catheter or drainage tubing. Sometimes spasms are caused by the catheter irritating the bladder, prostate, or penis. Such spasms can be controlled with medication such as butylscopolamine, although most patients eventually adjust to the irritation and the spasms go away.

Common indications to catheterize a patient include acute or chronic urinary retention (which can damage the kidneys), orthopedic procedures that may limit a patient's movement, the need for accurate monitoring of input and output (such as in an ICU), benign prostatic hyperplasia, incontinence, and the effects of various surgical interventions involving the bladder and prostate.

For some patients the insertion and removal of a catheter causes excruciating pain, so a topical anesthetic is used. Catheterization would be performed as a sterile medical procedure by trained, qualified personnel, using equipment designed for this purpose, except in the case of intermittent self-catheterization where patients have been trained to perform the procedure themselves.

Intermittent self-catheterization is performed by the patient four to six times a day, using a clean technique in most cases. Nurses use a sterile technique to perform intermittent catheterization in hospital settings. Incorrect technique may cause trauma to the urethra or prostate (male), urinary tract infection, or a paraphimosis in the uncircumcised male. For patients with spinal cord lesions and neurogenic bladder dysfunction, intermittent catheterisation (IC) is a standard method for bladder emptying. The technique is safe and effective and results in improved kidney and upper urinary tract status, lessening of vesicoureteral reflux and amelioration of continence. In addition to the clinical benefits, patient quality of life is enhanced by the increased independence and security offered by self-catheterization.

Catheter maintenance:

A catheter that is left in place for more than a short period of time is generally attached to a drainage bag to collect the urine. This also allows for measurement of urine volume. There are three types of drainage bags: The first is a leg bag, a smaller drainage device that attaches by elastic bands to the leg. A leg bag is usually worn during the day, as it fits discreetly under pants or skirts, and is easily emptied into a toilet. The second type of drainage bag is a larger device called a down drain that may be used overnight. This device is hung on a hook under the patient's bed—never placed on the floor, due to risk of bacterial infection. The third is called a belly bag, and is secured around the waist. This bag can be worn at all times. It can be worn under the patient's underwear to provide a totally undetectable look.

During long-term use, the catheter may be left in place all the time, or a patient may be instructed on a procedure for placing a catheter just long enough to empty the bladder and then removing it (known as intermittent self-catheterization). Patients undergoing major surgery are often catheterized and may remain so for some time. The patient may require irrigation of the bladder with sterile saline injected through the catheter to flush out clots or other matter that does not drain.

Effects of long term use:

The duration of catheterization can have significance. Incontinent patients commonly are catheterized to reduce their cost of care.However, long-term catheterization carries a significant risk of urinary tract infection. Because of this risk catheterization is a last resort for the management of incontinence where other measures have proved unsuccessful. Other long term complications may include blood infections (sepsis), urethral injury, skin breakdown, bladder stones, and blood in the urine (hematuria).After many years of catheter use, bladder cancer may also develop.

Preventing infection:

Everyday care of catheter and drainage bag is important to reduce the risk of infection.

Such precautions include:

Cleansing the urethral area (area where catheter exits body) and the catheter itself.

Disconnecting drainage bag from catheter only with clean hands

Disconnecting drainage bag as seldom as possible.

Keeping drainage bag connector as clean as possible and cleansing the drainage bag periodically.

Use of a thin catheter where possible to reduce risk of harming the urethra during insertion.

Drinking sufficient liquid to produce at least two liters of urine daily

Sexual activity is very high risk for urinary infections, especially for catheterized women.

There is no clear evidence that any one catheter type or insertion technique is superior than another in preventing infection.

Recent developments in the field of the temporary prostatic stent have been viewed as a possible alternative to indwelling catheterization and the infections associated with their use

Ascites Tapping

Indications

Diagnostic (via either ascitic tap or paracentesis)

New-onset ascites:

To determine aetiology.

To differentiate transudate versus exudate.

To detect cancerous cells.

Suspected spontaneous or secondary bacterial peritonitis

Therapeutic (usually via paracentesis)

To relieve respiratory distress or abdominal pain resulting from ascites.

Contra-indications:

An unco-operative patient.

Skin infection at the proposed puncture site.

Pregnancy.

Severe bowel distension.

Coagulopathy (opinion is divided - some feel only precluded where there is clinically evident fibrinolysis or disseminated intravascular coagulation (DIC)).

Investigations

Prior to tap

Before tapping, there are certain investigations that should be undertaken:

FBC and clotting screen - if thrombocytopenia is present and severe, most clinicians would give pooled platelets to reduce the risk of bleeding. Fresh frozen plasma may be used if there is evidence of coagulopathy.

U&E, creatinine, and LFTs.

Abdominal ultrasound - this is not always necessary prior to tap. It is used to review liver, pancreas, spleen and lymph nodes. Ultrasound is a very sensitive means of assessing the extent of ascites and may also show the causative pathology such as carcinoma of ovary or metastatic liver disease.

Following the tap

After a diagnostic tap the following investigations may be requested.

Microscopy: white cell count, red cell count, Gram stain

Spontaneous bacterial peritonitis (SBP) can occur in patients with cirrhosis and ascites admitted to hospital.

Neutrophil count of >250 cells/mm3are diagnostic of SBP.

The red blood cell count is is usually <1,000 cells/mm3 - higher levels raise the suspicion of an underlying malignancy - eg, hepatocellular carcinoma.

Gram stain of ascitic fluid is a quick process but rarely helpful. Samples should also be sent for culture and sensitivity. These should be inoculated into blood culture bottles as soon as the sample is taken. This has almost double the yield of ascitic fluid sent in sterile containers.

Albumin or protein levels

Traditionally ascites was labelled as an exudate if the protein levels were >25 g/L, or a transudate if protein levels were <25 g/L. This has been superseded by the serum ascites-albumin gradient (SA-AG) which is a better measure.

SA-AG = serum albumin concentration - ascitic albumin concentration

SA-AG ≥11 g/L: likely causes - cirrhosis, cardiac failure, nephrotic syndrome

SA-AG <11 g/L : likely causes - malignancy, pancreatitis and tuberculosis

Amylase

This will be high in pancreatitis associated ascites.

Cytology

The yield is greater with larger-volume samples (>100 ml), especially when concentration techniques are used. It is not so valuable for the diagnosis of primary hepatocellular carcinoma.

Risks

Paracentesis is a relatively safe procedure. Complications are more likely to occur when other comorbidities are present. Current British guidelines consider the risk of serious complication as about 1 in 1,000.Risks include:

Significant bleeding

Infection

Renal failure

Hyponatremia

Hepatic encephalopathy

Complicated bowel perforation

Paracentesis leak

Precautions

Paracentesis for symptom relief is common especially if there is tense ascites. Patients requiring frequent paracentesis need to be reviewed by specialists for consideration of transjugular intrahepatic portosystemic shunt.

Paracentesis is performed under aseptic conditions, as there is a risk of introduction of infection into the peritoneal cavity. Infection risk can also be reduced by limiting catheter drainage time to less than 6-8 hours (some authorities suggest four hours).

Paracentesis can be performed in a hospice or in an ambulatory setting, provided that sterile precautions are taken preventing the need for admission to hospital.

Technique

Check that the correct equipment has been assembled:

Needles (25 gauge for infiltration, 22 gauge for fluid collection), syringes and local anaesthetic (may not be necessary for a tap).

Antiseptic skin preparation (value unproven) and drapes.

A very wide bore IV cannula, IV giving set and a urine bag of the type attached to a catheter.

Adhesive tape.

Surgical gloves.

Explain the procedure to the patient, including risks, and obtain consent.

Position the patient, usually in the supine position with the head of the bed elevated to allow fluid to accumulate in the patient's lower abdomen.

Position of the tap:

Locate area of flank dullness lateral to the rectus abdominis muscle and go approximately 5 cm superior and medial to the anterior superior iliac spines.

Avoid the inferior epigastric vessels which run up the side of the rectus abdominis to anastomose with the superior epigastric vessels coming down.

Avoid the pelvic area, solid tumour masses, prominent superficial veins (caput medusa) and scars (may have collateral vessels close by or adherent bowel beneath).

Using local anaesthetic if needed, the needle is inserted and fluid aspirated.

If this does not work then ultrasound guidance may help, especially for a small amount of ascites.

10-20 ml of fluid can be aspirated for diagnostic purposes.

If a therapeutic tap is required, an IV cannula is placed using the Z track technique. This involves puncturing the skin perpendicularly and advancing the needle obliquely in subcutaneous tissue. This reduces leakage following the procedure, as the puncture site on the skin and the peritoneum are not adjacent.

Once the cannula is in place the needle is withdrawn and a giving set and collection bag connected. Drain for 6-8 hours and then remove the cannula or catheter and cover with a simple adhesive bandage.

Swift drainage is safest but if the patient develops symptoms of hypotension then the drainage may need to be slowed or prematurely terminated.

Large volumes can be taken off within 2-4 hours but this can reduce both the intra-abdominal and inferior vena cava pressure. In response the cardiac output may increase. This may lead to a reduction in blood pressure and should be anticipated at the outset. In practice colloid replacement is usually given.

Post-paracentesis circulatory dysfunction

Withdrawal of 5 L or more of ascites can precipitate post-paracentesis circulatory dysfunction (PPCD):

Hyponatraemia

Acute kidney injury

Increased plasma renin activity

Current guidelines suggest that albumin (as 20% or 25% solution) should be infused after paracentesis of ≥5 L is completed, at a dose of 8 g albumin/L of ascites removed.

There is no conclusive evidence that albumin or artificial plasma expanders prevent complications or improve outcomes.

Aftercare

Ascites may recur requiring repeated paracentesis.

Look out for intraperitoneal infection - eg, signs of peritoneal irritation and fever.

Terminal care

The underlying disease is an important confounding factor and in terminal care, the prime concern must be patient comfort. In malignant disease, tapping ascites brings some relief to about 90% of patients.Where frequent drainage is required, a permanent drain can be left in place; although this increases the risk of infection, there is a notable reduction in symptom burden in most patients.

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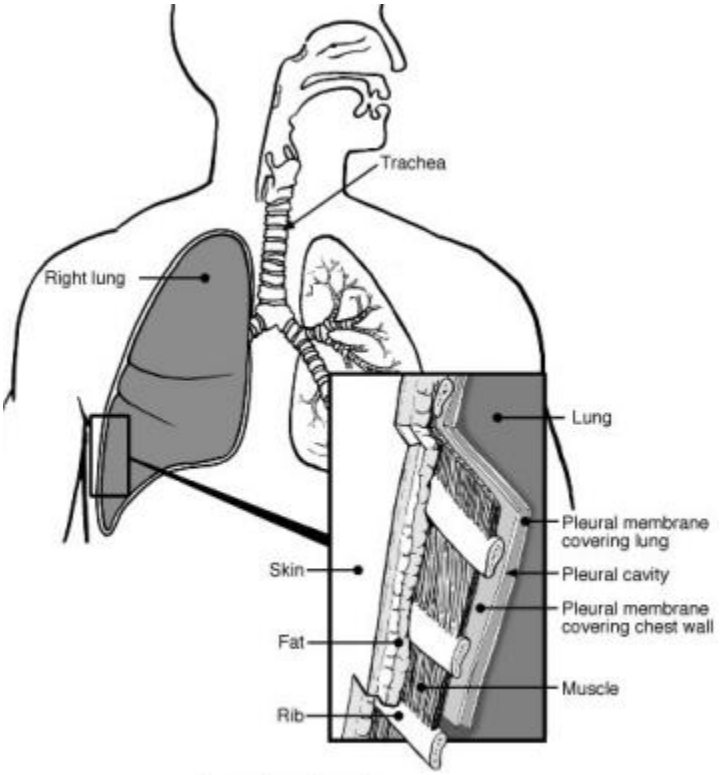
Pleural Effusion

What is a pleural effusion?



Lung showing pleura

A pleural effusion means that there is a build-up of fluid between a lung and the chest wall.

The pleura is a thin membrane that lines the inside of the chest wall and covers the lungs. There is normally a tiny amount of fluid between the two layers of pleura. This acts like lubricating oil between the lungs and the chest wall as they move when you breathe. A pleural effusion develops when this fluid builds up and separates the lung from the chest wall.

What are the causes of a pleural effusion?

A pleural effusion is a complication of various conditions. The following are some of the more common causes of a pleural effusion (but there are other rarer causes too):

Lung infection (pneumonia), tuberculosis, and cancers may cause inflammation of the lung and pleura. This may cause fluid to build up into a pleural effusion.

Some arthritic conditions may cause inflammation of the pleura in addition to joint inflammation. For example, pleural effusion is an uncommon complication of rheumatoid arthritis and systemic lupus erythematosis (SLE).

Heart failure causes 'back pressure' in the veins (blood vessels) that take blood back to the heart. Some fluid may seep out of the blood vessels. Swelling of the legs with fluid is typical with heart failure, but a pleural effusion may also develop.

A low level of protein in the blood also tends to allow fluid to seep out of the blood vessels. For example, cirrhosis of the liver and some kidney diseases may cause a low level of blood protein which allows a pleural effusion to develop.

What are the symptoms?

You may feel some chest pain but a pleural effusion is often painless. The amount of fluid varies. As the effusion becomes larger, it presses on the lung, which cannot expand fully when you breathe. You may then become breathless.

You may also have symptoms of the condition that is causing the effusion. As a whole range of conditions can cause a pleural effusion, there is a large range of other symptoms that may occur, depending on the underlying cause. One example is you may have a cough and a high temperature (fever) if the cause is lung infection (pneumonia).

Are any tests needed?

A chest X-ray usually confirms a build-up of fluid between a lung and the chest wall (pleural effusion). If the cause of the effusion is known then no further tests may be needed. However, sometimes a pleural effusion is the first sign of an underlying condition. Further tests may then be advised to find the cause of the effusion. These may include lung tests, blood tests and taking a sample of the fluid and pleura to examine in the laboratory.

What is the treatment for a pleural effusion?

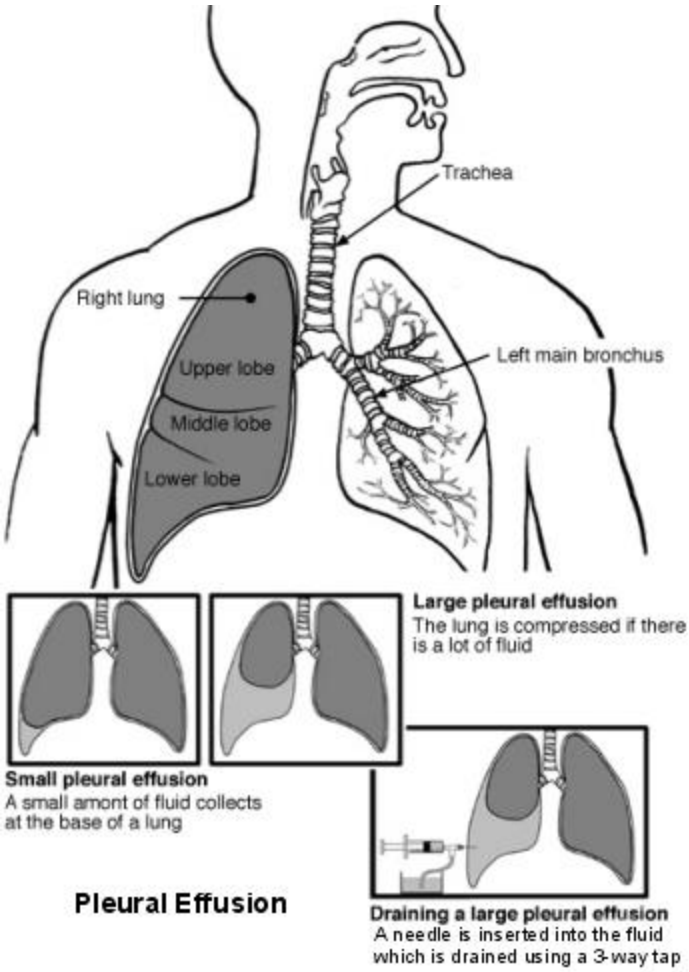
Treating the underlying cause

A major part of treatment is usually directed to the underlying cause of the build-up of fluid between the lung and the chest wall (pleural effusion). For example, medicines called antibiotics for lung infection (pneumonia), chemotherapy or radiotherapy for cancers, etc. Therefore, treatment can vary greatly, depending on the cause of the effusion. If the underlying cause can be successfully treated then there is a good chance that the pleural effusion will go away for good. If the underlying cause cannot be treated, or can only be partially treated, the effusion may return if it is cleared (drained).

Treating the effusion itself

Small effusions that cause no symptoms, or only mild symptoms, may just be left and 'observed'. Treatment is usually only needed if the effusion causes symptoms such as breathlessness.

A large pleural effusion that makes you breathless can be drained. This is called a pleural fluid aspiration or pleural tap. It is usually done by inserting a needle or tube through the chest wall. A local anaesthetic is injected into the skin and chest wall first to make the procedure painless. This may be a 'one-off' procedure to relieve symptoms.



However, in many cases, unless the underlying cause can be treated, an effusion is likely to return within a few weeks. Repeated draining of the fluid, when symptoms become troublesome, is one option.

Depending on the underlying cause, other treatment options that are sometimes considered include:

Pleurodesis. In this procedure, a special chemical (a sclerosant) is injected into the pleural space. This causes inflammation of the pleural membranes and helps them to 'stick' together. This helps to prevent fluid building up again into an effusion. Sclerosing chemicals that are commonly used include tetracycline, sterile talc and bleomycin. Pleurodesis is most often used in the treatment of repeated (recurrent) effusions caused by cancer.

Leaving a permanent drain in place so the fluid can drain out as and when it forms.

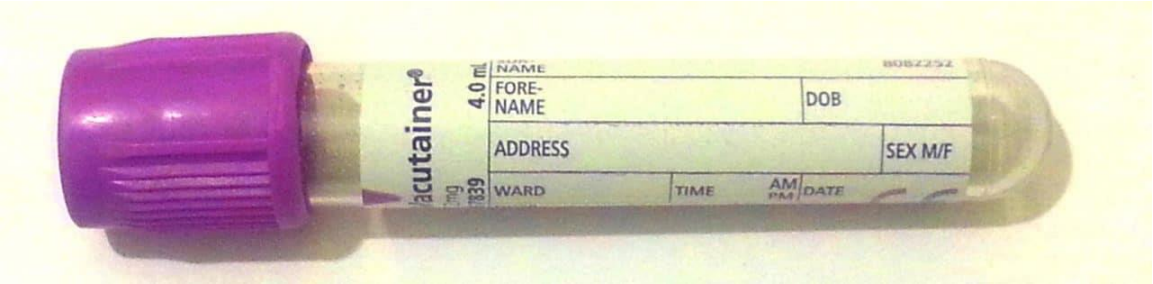
An operation to insert a shunt (like an internal drain) to allow the fluid to drain out from the chest into the tummy (abdominal) cavity. This is called a 'pleuroperitoneal shunt'. It is only occasionally used.

Pleurectomy. This is an operation to remove the pleura. It is sometimes used in people with effusions due to cancer when other treatment options have failed.

BLOOD BOTTLES GUIDE

THE PURPLE ONE (aka "Lavender")

purple brighter



These bottles are generally used for haematology tests where whole blood is required for analysis.

ADDITIVE: contains EDTA (ethylenediaminetetraacetic acid), which acts as a potent anticoagulant by binding to calcium in the blood. EDTA also binds metal ions in the blood and is used in chelation therapy to treat iron, lead or mercury poisoning. Its blood-binding capacity also means it can be labelled with radioisotopes and used as an EDTA scan to test renal glomerular filtration rate.

COMMON TESTS:

Full blood count (FBC)

Erythrocyte sedimentation rate (ESR)

Blood film for abnormal cells or malaria parasites

Reticulocytes

Red cell folate

Monospot test for EBV

HbA1C for diabetic control

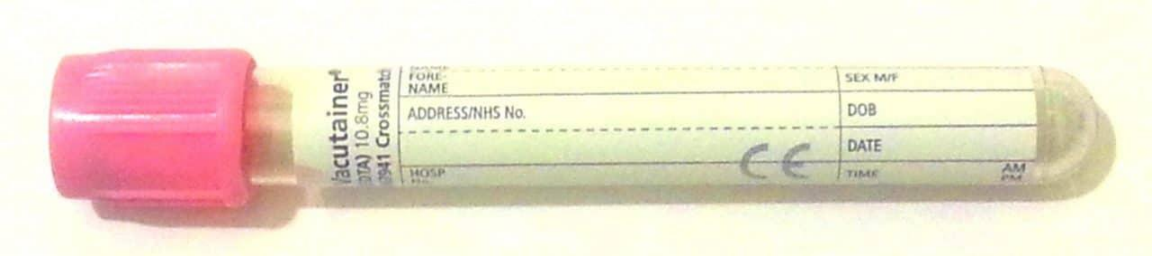
Parathyroid hormone (PTH)*

Less commonly used for: ciclosporin/tacrolimus levels, some viral PCR tests, G6PD, ACTH level*, porphyria screen*, plasma metanephrines*, fasting gut hormone screen*

TIPS FOR USE: the purple tube needs inverting about 8 times to mix the sample with the EDTA. About 1ml of blood is sufficient to do a full blood count, but to get an ESR you need a full purple bottle.

THE PINK ONE

pink brighter



The pink bottles work in the same way as the purple ones, but are specifically used only for whole blood samples being sent to the transfusion lab.

ADDITIVE: this tube also contains the anticoagulant EDTA.

COMMON TESTS:

Group and save (G&S) – this simply means the patient's blood is typed and tested for antibodies, then saved in the lab in case it is required; it DOES NOT get you blood products for transfusion. If you need blood products you have to request a crossmatch.

Crossmatch (XM) – this means that the patient's blood is typed and tested as above, then matched to specific units of blood, platelets or other products for transfusion. You need to specify on the form how many units you need, why you need them and when they are required. A full crossmatch takes about 45-60 minutes in the lab – if you have an unstable bleeding patient and think you'll need blood products sooner than this, you still need to send a crossmatch sample, but you can ask the lab for units of type-specific blood (which take 10-20 minutes), or in a genuine emergency you can use their stocks of O negative blood from the fridge.

Direct Coomb's test (aka direct antiglobulin test) for autoimmune haemolytic anaemia

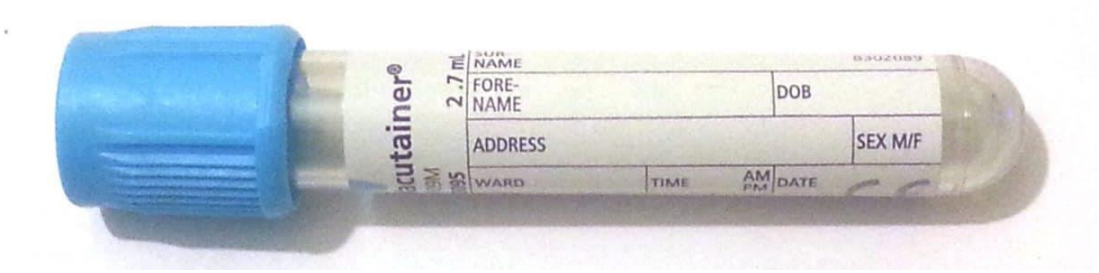
Less commonly used for: testing for specific red cell antibodies (3 bottles required), can be used for other haematology tests such as FBC if the ward runs out of purple bottles.

TIPS FOR USE: the pink tube needs inverting about 8 times to mix the sample with the EDTA. It should contain at least 1ml of blood, but more is preferred by the labs if at all possible. It has a special label

which needs to be carefully filled in by hand at the bedside to ensure the correct patient details are used and prevent potentially catastrophic mismatched blood transfusions. If you need blood for a patient urgently or have any unusual or complicated requests, you must ring the transfusion lab and let them know, or you risk invoking their terrifying wrath.

THE BLUE ONE

blue



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The blue bottle is used for haematology tests involving the clotting system, which require inactivated whole blood for analysis.

ADDITIVE: contains buffered sodium citrate, which acts as a reversible anticoagulant by binding to calcium ions in the blood and subsequently disrupting the clotting cascade. Sodium citrate is also added to blood products for transfusion, and acts as a preservative by stopping them from clotting in the bag.

COMMON TESTS:

Coagulation screen including bleeding time for platelet function, prothrombin time (PT) for extrinsic pathway, activated partial thromboplastin time (APTT) for intrinsic pathway, and thrombin time (TT) or fibrinogen assay for the final common pathway

D-dimer for thrombosis e.g. due to DVT or PE

INR for monitoring patients on warfarin (this is calculated from the prothrombin time)

Activated partial thromboplastin ratio (APTR) for monitoring patients on IV heparin infusions (this is calculated from the APTT)

Anti-Xa assay for monitoring patients on high-dose low molecular weight heparins like tinzaparin

Less commonly used for: specific clotting factors e.g. factor VIII, factor IX, von Willebrand factor, thrombophilia screen, lupus anticoagulant

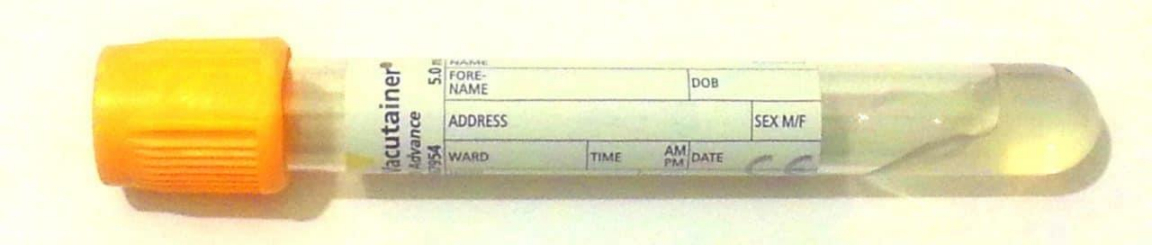
TIPS FOR USE: the blue bottle needs to be inverted 3-4 times to mix the sample with the anticoagulant. The sodium citrate liquid in the bottle dilutes the blood sample, and the machines in the lab are specifically calibrated to interpret results based on a set ratio of blood to anticoagulant. It is therefore essential that the bottle is filled to the line marked around its edge to ensure the tests are interpreted accurately – otherwise, the samples may be over-anticoagulated.

Something else that took me a long time to realise was that if you use a blood collection system (e.g. a butterfly needle with some attached tubing) when you attach the blue bottle it draws in the excess air from the tubing which can result in the blood not filling the blue bottle to the required line (as the vacuum has been partially filled with air instead of blood). To get around this you can attach a second bottle (as the tubing should now contain only blood and no air) or if you are taking a set of bloods requiring multiple bottles (e.g gold top, purple top and a blue top), ensure you don't attach the blue bottle first.

Some clotting tests need to be taken at specific times; INRs should ideally be done in the morning, and anti-Xa assays must be taken 3-4 hours after tinzaparin is given. APTR timings are often indicated on the prescription algorithm.

THE YELLOW ONE (aka "Gold")

yellow brighter



These bottles are used for a huge variety of tests requiring separated serum for analysis, including biochemistry, endocrinology, oncology, toxicology, microbiology and immunology.

ADDITIVE: this tube is known in the lab as the SST (serum separating tube). It contains two agents; silica particles and a serum separating gel. The silica particles work to activate clotting and cause the blood cells to clump together. The serum separator consists of an inert polymer gel which floats as a layer between the blood cells and plasma to form a physical barrier between them. This means that the sample can be centrifuged (spun) in the lab and the separated serum easily removed.

COMMON TESTS:

Biochemistry tests are the ones you will encounter most commonly:

Urea and electrolytes (U+E) – this includes urea, creatinine, sodium and potassium

C-reactive protein (CRP)

Liver function tests (LFTs) – this includes bilirubin, ALP, AST/ALT, GGT, total protein and albumin

Amylase assay

Bone profile – this includes calcium, phosphate, ALP and albumin

Magnesium assay

Iron studies – this includes serum iron, ferritin, transferrin saturation and total iron binding capacity

Lipid profile – this includes cholesterol, LDL, HDL and triglycerides

Thyroid function tests (TFTs) – this includes TSH, free T4 +/- free T3

Vitamins e.g. vitamin B12

Troponins – this requires 2 samples to be taken at different times to assess the acute trend

Creatine kinase (CK)

Urate

Serum osmolality – this requires a urine sample to be taken at the same time

Endocrinology: beta-hCG, calcitonin*, cortisol, EPO, sex hormones, growth hormone, IGF-1

Tumour markers: PSA, CEA, CA-125, CA19-9, AFP, lactate dehydrogenase (LDH)

Toxicology: ethanol, cannabis, opiates, benzodiazepines, other drugs e.g. cocaine, amphetamines

Drug levels: paracetamol, salicylates (aspirin), digoxin, lithium, gentamicin, carbamazepine

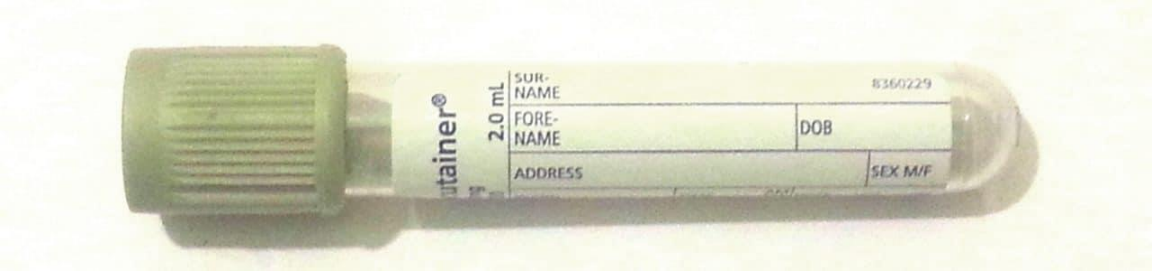
Microbiology/virology: serology for a wide variety of bacterial, viral, fungal and parasitic infections including HIV and viral hepatitis

Immunology: immunoglobulins, complement, autoantibody screen, rheumatoid factor, thyroid antibodies, α1AT, ACE

TIPS FOR USE: the yellow bottle needs to be inverted about 5 times to mix the sample with the silica and separator. Don't panic if the blood starts to clot or separate in the bottle, it's supposed to! The amount of blood required will depend on how many tests you're doing, but at least 1ml is ideal. You can usually get about 12 tests from one full yellow bottle. Remember that different labs may be located in different areas and technicians don't like sharing – this means you'll need to put your biochemistry and microbiology samples in separate yellow bottles to go to their respective laboratories.

THE GREY ONE

grey brighter



The grey bottle is only used for two tests, so compared to the yellow one it's fairly easy to remember! It is used for biochemistry tests requiring whole blood for analysis.

ADDITIVE: contains two main agents. Sodium fluoride acts as an antiglycolytic agent to ensure that no further glucose breakdown occurs within the sample after it is taken. Potassium oxalate acts as an anticoagulant. Some variants of the grey bottle use EDTA as the anticoagulant instead.

COMMON TESTS:

Glucose – this can be fasting or non-fasting, or part of a glucose tolerance test (GTT)

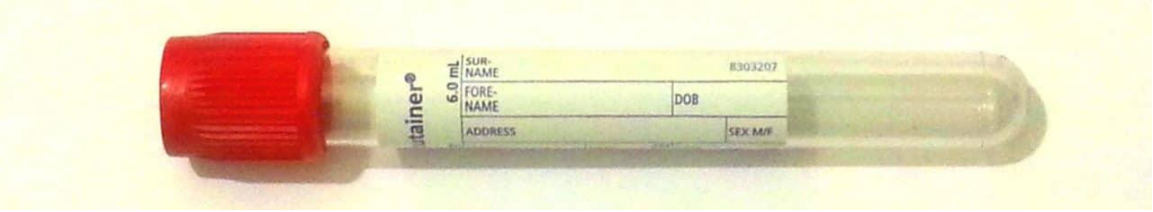
Lactate

Less commonly used for: blood ethanol if not for legal purposes

TIPS FOR USE: the grey bottle needs to be inverted about 8 times to mix the sample with the fluoride and oxalate. Only a tiny amount of blood is required for a glucose, but for a lactate the bottle should ideally contain at least 1ml of blood. Venous glucose results are generally more accurate than finger prick BM tests, especially in hyperglycaemic patients, but can take a while to come back from the lab. If you need a blood glucose urgently then ask one of the nurses to do a BM for you on the ward. Samples for venous lactate need to be sent to the lab immediately. Again, the results tend to take a while to come back, so if you're desperate for a lactate see if you can get access to an ABG machine that does arterial lactates – these are often available in A+E or ITU, and take about 2 minutes to process.

THE RED ONE

red brighter



The red bottle is less common – it is used for biochemistry tests requiring serum which might be adversely affected by the separator gel used in the yellow bottle.

ADDITIVE: contains silica particles which act as clot activators.

COMMON TESTS:

The use of this bottle varies greatly – some hospitals use it for many sensitive tests, including hormones, toxicology, drug levels, bacterial and viral serology and antibodies, whereas others seem to only use it for a few very specific purposes and use the yellow bottle for most things.

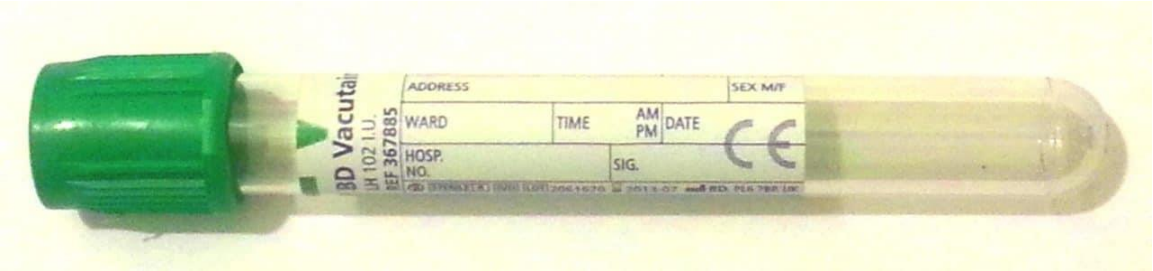
My hospital definitely uses it for ionised calcium, but not much else

Less commonly used for: fluoride, cryoglobulins, cold agglutinins

TIPS FOR USE: the red bottle needs inverting 5 times to mix the sample with the clot activator. There is also another version of the red bottle made out of glass, which contains no additives whatsoever.

THE DARK GREEN ONE

dark green brighter



This less commonly used bottle is for biochemistry tests which require heparinized plasma or whole blood for analysis.

ADDITIVE: contains sodium heparin, which acts as an anticoagulant.

COMMON TESTS:

Ammonia*

Insulin*

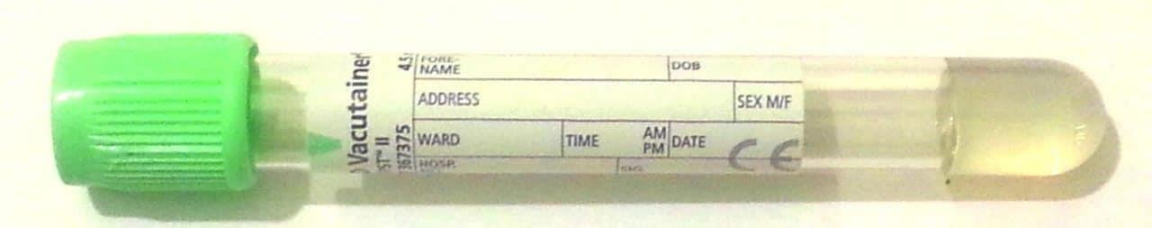
Renin and aldosterone

Less commonly used for: aluminium, gut hormones, amino acids, homocysteine, chromosomal tests

TIPS FOR USE: the green bottle needs to be inverted about 8 times to mix the sample with the heparin. This bottle cannot be reliably used to assess sodium levels.

THE LIGHT GREEN ONE

light green brighter



This rare species of bottle is used for biochemistry tests requiring separated heparinized plasma. I have never actually used one but have seen them on the dermatology ward.

ADDITIVE: this bottle is known as the plasma separator tube (PST). It contains lithium heparin, which acts as an anticoagulant, and a plasma separator gel similar to that used in the yellow bottle, which acts to separate out the plasma layer.

COMMON TESTS: it can be used for routine biochemistry, but most hospitals seem to use the yellow bottle for this. It can also be used for blood ethanol provided the sample is not for legal purposes.

TIPS FOR USE: the light green bottle needs inverting about 8 times to mix the sample with the heparin and separator. This bottle cannot be reliably used to assess lithium levels.

Dark blue – used for toxicology and trace elements such as zinc, selenium and copper (however, the ever-versatile yellow bottle can also be used for these)

Tan – used to test for lead

Orange – contains a thrombin-based clot activator which allows stat serum testing

Light yellow – used for HLA phenotyping, tissue typing, DNA analysis and paternity testing

White – used for molecular diagnostics such as PCR and DNA amplification studies

Black – for paediatric ESR

Clear lid – used as a discard tube, for example when taking bloods from a central line

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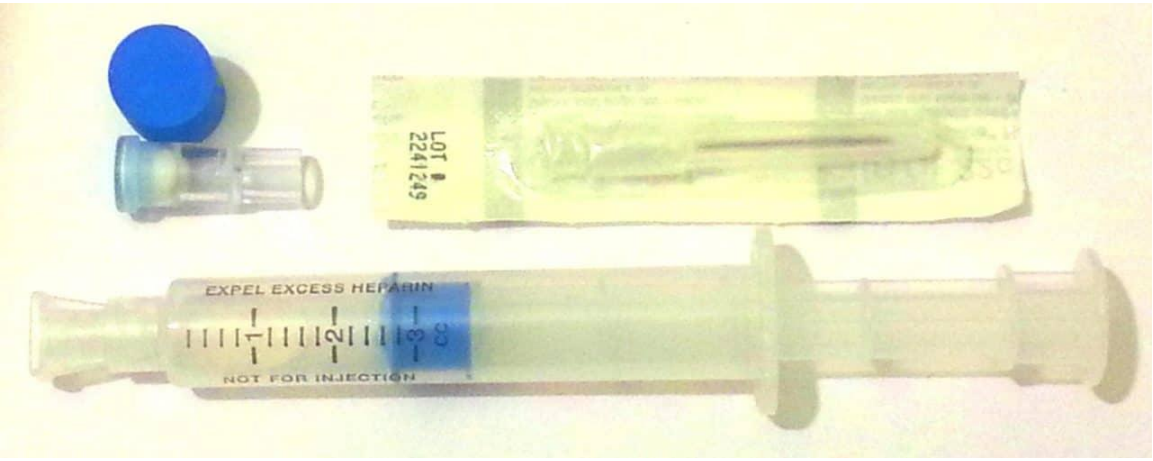
BLOOD CULTURES

Blood culture bottles contain a culture medium to encourage the growth of any bacteria in the blood sample. There are different bottles available with culture media for aerobic (blue lid) and anaerobic (purple lid) organisms, alongside a variety of others, including one with a black lid for mycobacterial cultures. Until recently, many hospitals required both aerobic and anaerobic culture samples from a patient, whilst others were happy with just aerobic samples. However, there is now a move towards using the purple top (aka “burgundy”) anaerobic bottles as the standard receptacle for all blood cultures, as studies have shown that they are more effective. Check local guidelines if you’re not sure.

TIPS FOR USE: blood cultures must be obtained using aseptic non-touch technique (ANTT) to prevent contamination of the samples with the patient's skin flora or any bugs that might be lurking on your hands. They should also be taken before any antibiotics are started. The blood culture bottle should always be the first one you fill, and ideally needs 8-10ml of blood to ensure a good chance of catching any organisms. In a perfect world, you would also take another culture from a different site to maximise the diagnostic yield. The results take about 5 days to come back, so if your patient is septic you need to ring microbiology and start them on some empirical antibiotic treatment in the meantime.

ARTERIAL BLOOD GASES (ABGs)



An ABG is a very useful test when you find yourself confronted with a critically unwell patient, as it tells you about their oxygenation, their acid-base balance, and in some cases their potassium and lactate as well, and the results are available within minutes.

TIPS FOR USE: ABG syringes contain heparin to prevent the sample from clotting – you need to expel this through the needle before taking your sample. Some fill automatically as the plunger is pushed back by the pressure of the blood coming through the needle, whilst others require you to pull on the plunger yourself to fill the syringe. Try to get the self-filling ones – like those shown above – if you can, as they are infinitely better. Compared to taking venous bloods, ABGs are technically more challenging, riskier and much more uncomfortable for the patient. For more detail and tips on how to take an ABG, see here for the Geeky Medics OSCE guide. Once you have obtained your sample it needs to be taken straight to the lab, as it will become denatured and useless within 10 minutes. To learn how to interpret an ABG, check out our guide here.

OTHER TIPS FOR EASY BLOOD-TAKING

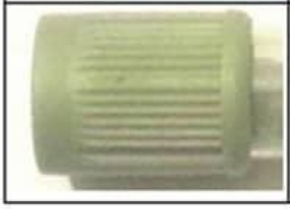
"Invert" doesn't mean "shake". Be gentle with your samples or they'll haemolyse.

Tests above with a star (*) next to them need to be sent to the lab immediately “on ice” – to do this you either need to get a special ice bag directly from the lab, or if your ward has an ice freezer you can make one yourself by filling a normal sample bag with crushed ice. If you’re not sure you’re doing it right, ring the lab and check, because they can make life very difficult by refusing to accept specimens.

The bottles can be used for other non-blood fluids too, for example, pleural aspirates, ascitic taps and CSF samples obtained by lumbar puncture. The tests each bottle is used for are the same: the purple one is for cell count, the yellow one is for electrolytes, albumin and LDH, the grey one is for glucose, and blood culture bottles can be used for fluid cultures. Don’t forget to specify on your request form what kind of fluid is in the bottle and which part of the patient you got it from.

If you are ever unfortunate enough to find yourself having to get bloods from a child, there are special paediatric blood bottles which are much smaller than the adult ones. The colours are pretty much the same. If you get really stuck and can’t find any, you can use adult bottles instead, but always take them to the lab and explain they are from a child so they don’t reject them as inadequate (they usually have special machines for processing tiny kiddie samples but like to keep this a secret).

If you are unsure about what you need to do for a particular blood test, ask your friendly local lab technician. They are usually more than happy to give you advice as it means they can prevent you making mistakes that create lots of hassle and annoying paperwork. It’s also better for you if you check, as it saves you having to do your bloods all over again if you do it wrong, and saves your patient from the unpleasantness of unnecessary additional stabbings. Similarly, if you have a really urgent test or only got a pathetically minuscule blob of blood from your patient, take it down to the lab and explain things in person. You’ll find everything miraculously gets done ten times quicker, and smaller samples they would normally reject will often be accepted if you talk to them face-to-face and ask nicely.

	coagulation screen INR D-dimer	3-4
	U+E, CRP, LFTs, amylase calcium, phosphate, magnesium TFTs, lipid profile, troponins	5-6
	FBC, blood film ESR HbA1c	8-10
	group and save crossmatch	8-10
	glucose lactate GEEKY MEDICS © L J Watson 2015	8-10

References

BD Vacutainer Product FAQs, available from http://www.bd.com/vacutainer/faqs/

BD Vacutainer Venous Blood Collection Tube Guide, available from http://www.bd.com/vacutainer/pdfs/plus_plastic_tubes_wallchart_tubeguide_VS5229.pdf

another version of the BD Vacutainer Tube Guide including the Order of Draw, available from http://www.kch.nhs.uk/Doc/mi%20-%20059.1%20-%20guide%20to%20blood%20collection%20tubes.pdf

UCI Pathology Services Manual – Specimen Tube Containers, available from http://www.pathology.uci.edu/PathologyServicesManual/SpecTubesContainers.html

Pediatric Dosage Calculations

General

Most drugs in children are dosed according to body weight (mg/kg) or body surface area (BSA) (mg/m2). Care must be taken to properly convert body weight from pounds to kilograms (1 kg= 2.2 lb) before calculating doses based on body weight. Doses are often expressed as mg/kg/day or mg/kg/dose, therefore orders written "mg/kg/d," which is confusing, require further clarification from the prescriber.

Chemotherapeutic drugs are commonly dosed according to body surface area, which requires an extra verification step (BSA calculation) prior to dosing. Medications are available in multiple concentrations, therefore orders written in "mL" rather than "mg" are not acceptable and require further clarification.

Dosing also varies by indication, therefore diagnostic information is helpful when calculating doses. The following examples are typically encountered when dosing medication in children.

Example 1.

Calculate the dose of amoxicillin suspension in mLs for otitis media for a 1-yr-old child weighing 22 lb. The dose required is 40 mg/kg/day divided BID and the suspension comes in a concentration of 400 mg/5 mL.

Step 1. Convert pounds to kg: 22 lb × 1 kg/2.2 lb = 10 kg

Step 2. Calculate the dose in mg: 10 kg × 40 mg/kg/day = 400 mg/day

Step 3. Divide the dose by the frequency: 400 mg/day ÷ 2 (BID) = 200 mg/dose BID

Step 4. Convert the mg dose to mL: 200 mg/dose ÷ 400 mg/5 mL = 2.5 mL BID

Example 2.

Calculate the dose of ceftriaxone in mLs for meningitis for a 5-yr-old weighing 18 kg. The dose required is 100 mg/kg/day given IV once daily and the drug comes prediluted in a concentration of 40 mg/mL.

Step 1. Calculate the dose in mg: 18 kg × 100 mg/kg/day = 1800 mg/day

Step 2. Divide the dose by the frequency: 1800 mg/day ÷ 1 (daily) = 1800 mg/dose

Step 3. Convert the mg dose to mL: 1800 mg/dose ÷ 40 mg/mL = 45 mL once daily

Example 3.

Calculate the dose of vincristine in mLs for a 4-yr-old with leukemia weighing 37 lb and is 97 cm tall. The dose required in 2 mg/m2 and the drug comes in 1 mg/mL concentration.

Step 1. Convert pounds to kg: 37 lb × 1 kg/2.2 lb = 16.8 kg

Step 2. Calculate BSA: √16.8 kg × 97 cm/3600 = 0.67 m2

Step 3. Calculate the dose in mg: 2 mg/m2 × 0.67 m2 = 1.34 mg

Step 4. Calculate the dose in mL: 1.34 mg ÷ 1 mg/mL = 1.34 mL

Emergency Medicine in Pediatrics

- **ANAPHYLAXIS:**

Anaphylaxis is a type I hypersensitivity reaction triggered by crosslinking of IgE on mast cells. It occurs when enough antigen enters the systemic circulation to activate circulating basophils and tissue mast cells. This results in the release of inflammatory mediators, particularly histamine, prostaglandins and leukotrienes. These mediators cause massive peripheral vasodilation (cardiorespiratory arrest, shock), increased vascular permeability (angiooedema, airway obstruction and urticaria), intense contraction of non-vascular smooth muscle (bronchoconstriction), abdominal pain, nausea, vomiting and tachycardia. Anaphylaxis may be due to drugs, insect stings , foods, plants, chemicals or latex.
Anaphylaxis may progress slowly or rapidly and may range from a mild cutaneous reaction to circulatory arrest

RECOGNITION
Clinical assessment should include rapid physical examination, with attention to airway, breathing and circulation, measurement of peak expiratory flow rate (PEFR) in children able to perform the technique and pulse oximetry. Children should be examined for generalized oedema, angiooedema, erythematous rash and urticaria and a history taken for substance exposure (with particular reference to drugs or foodstuffs).
IMMEDIATE MANAGEMENT
Mild anaphylaxis
Mild reactions such as urticaria should respond to treatment with antihistamines and steroids. Drug treatment should be followed by a period of observation to ensure a more serious response does not occur.
Severe anaphylaxis
Patients should be treated with high flow oxygen, artificial ventilation and cardiac massage if necessary. If stridor is present, airway angioedema is likely and senior anaesthetic assistance

should be summoned to secure the airway. Intramuscular adrenaline should be administered as soon as possible in anaphylactic shock. The intravenous route should be reserved for extreme emergency when there is doubt as to the adequacy of the circulation.
The dose for intravenous epinephrine is 10 micrograms/kg (0.1 mL/kg of the dilute 1 in 10,000 epinephrine injection) by slow intravenous injection. However, when intramuscular injection might succeed, time should not be wasted seeking intravenous access. Adrenaline doses may be repeated at 5-minute intervals if necessary. Hypotension in anaphylaxis is due to vasodilatation and capillary leak and resuscitation with colloid is necessary to restore circulation. Steroids and antihistamines should be given and if the patient's condition is not stable an adrenaline infusion should be commenced. Bronchospasm,
if present, may respond to adrenaline and steroids. If mechanical ventilation is necessary, a slow rate and long expiratory time should be used to allow full expiration to occur. Refractory bronchospasm should be treated as severe asthma.

Dose of intramuscular injection of adrenaline for anaphylactic shock

- **Under 6 months:** epinephrine 50 micrograms (0.05 ml of adrenaline 1 in 1,000 (1 mg/ml)
- **6 months to 6 years:** epinephrine 120 micrograms (0.12 ml of epinephrine 1 in 1,000 (1 mg/ml)
- **6–12 years:** epinephrine 250 micrograms (0.25 ml of epinephrine 1 in 1,000 (1 mg/ml)
- **Adult and adolescent:** epinephrine 500 micrograms (0.5 ml of epinephrine 1 in 1,000 (1 mg/ml)

FOLLOW UP

The causative allergen may be identified by taking a careful history. Further investigation may include skin prick testing (SPT). Radioabsorbent assays (RAST) for specific IgE is often performed but 50% of those with positive SPT/RAST will have no symptoms and 50% of those with confirmed allergy will have negative SPTs. The gold standard test for diagnosis of food allergy remains the food challenge. This should be carried out in a centre with adequate resuscitation facilities. Any child who has had a serious reaction to peanuts should avoid all peanut products including oil. Peanuts are legumes and, although it is uncommon for patients to react to other legumes, cross-reactivity with tree nuts can occur. Peanut sensitive individuals should be introduced to these singly and with caution. If there is evidence of a severe food or other allergy, the findings should be clearly documented and explained to the patient. Management primarily consists of avoidance. However, patients should also be instructed to carry a hand held summary and to wear a warning bracelet or necklace. Patients or parents of children at risk of anaphylactic reactions to foods, environmental allergens, chemicals, or plants should carry injectable adrenaline at all times and know how to use it in an emergency.

- **UPPER AIRWAY OBSTRUCTION**

Stridor is an inspiratory noise related to obstruction of the extrathoracic airway. Dynamic intrathoracic airway obstruction can also result in expiratory stridor in conditions such as broncho- or tracheomalacia. Obstruction of the extrathoracic airway is most

commonly due to viral tracheitis but also occurs in bacterial tracheitis , foreign body aspiration and other conditions such as quinsy and epiglottitis. As these conditions have very different management, part of the assessment involves a process of differentiation between them.

IMMEDIATE ASSESSMENT AND MANAGEMENT

Initial assessment should include rapid physical examination of the airway, breathing and circulation, with particular attention to the work of breathing (i.e, respiratory rate, recession, use of accessory muscles) and pulse oximetry. Cyanosis, distress, exhaustion or oxygen saturations of <92% in air are all signs of severe obstruction and impending collapse. Children with these signs may require urgent intubation and ventilation and senior anaesthetic help should be summoned. Children with milder obstruction may require intravenous fluids in addition to more specific management. The presence of a high fever in a toxic looking child should raise the possibility of bacterial tracheitis or epiglottitis. If the child is stable, a brief history should be taken with regard to recent coryzal illness (suggestive of viral tracheitis), foreign body aspiration and haemophilus influenza immunization.

INVESTIGATIONS

Radiological investigations are not routinely required. Lateral neck x-rays are rarely helpful and immediate management (including intubation if necessary) is more important. A lateral neck film and chest radiograph should only be performed when the child is stable. Laboratory investigations need only be performed if intravenous access is required.

FURTHER MANAGEMENT

Bacterial tracheitis and viral tracheitis:

Children with mild or moderately severe viral tracheitis who do not require immediate intubation should be commenced on steroids, which have been shown to be of benefit in randomized controlled trials. However, children with bacterial tracheitis or severe viral tracheitis occasionally require intubation. A senior anaesthetist should be called as the child will almost certainly require inhalation anaesthesia. The use of paralysing agents in this setting is not recommended as when muscle tone is lost the airway may completely obstruct. While waiting for help nebulized adrenaline can be helpful in reducing airway oedema, but this should only be given in a high dependency area as reactive hyperaemia with worsening obstruction can occur when the nebulizer is completed. Children with suspected bacterial tracheitis may be septic and will require volume resuscitation prior to intubation. They should also have blood cultures sent and be commenced on antibiotics with good *Staphylococcus* and *Streptococcus* cover such as cefuroxime and flucloxacillin.

Foreign body

Aspiration of a foreign body may result in an asymptomatic child or cardiorespiratory collapse. Clearly, partial or complete obstruction at the level of the larynx or trachea may require urgent resuscitation. Again, senior anaesthetic help should be summoned. It may be possible to remove the foreign body at laryngoscopy with a Magill's forceps. If not, urgent tracheostomy may be required as a temporizing measure. A foreign body further down the airway may cause partial or complete obstruction of one or more major bronchi. A chest radiograph may demonstrate areas of hyperinflation or collapse, depending on the degree of airway obstruction. If in any doubt, inspiratory and expiratory films and the radiographic appearance of the pulmonary vascular tree will help to determine which lung is abnormal. These children will need to be referred to a specialist centre where rigid bronchoscopy can be performed to remove the foreign body.

Other

Epiglottitis has become extremely rare since the introduction of Haemophilus influenza immunization. If it is suspected, however, senior anaesthetic, ENT and paediatric advice should be sought. The airway will require securing, by tracheostomy if necessary, and the child will need volume resuscitation and antibiotic therapy with cefotaxime, which has good *Haemophilus* spp. cover. Quinsy (peritonsillar abscess) can often be seen on a lateral neck radiograph and will require incision and drainage, sometimes with a period of airway support while postoperative oedema settles.
Airway haemangiomas and tonsillar hypertrophy may require specific surgical management

- # ASTHMA

Asthma is a chronic disease characterized by reversible airflow obstruction, particularly in the bronchi, with recurrent bouts of wheezing and breathlessness. However, all that wheezes is not asthma and important differential diagnoses of acute severe asthma include foreign body aspiration and bronchiolitis. Asthma has increased in prevalence over recent years and now affects 10–20% of children in the UK. Acute exacerbations of asthma represent 10–15% of all acute medical admissions in children. About 20 children and about 1600 adults die in the UK every year due to acute severe asthma. Common factors leading to acute exacerbations include viral respiratory infections, irritants, exercise, and allergens.

RECOGNITION

Clinical assessment should include rapid physical examination, with attention to airway, breathing and circulation, measurement of peak expiratory flow rate (PEFR) and pulse oximetry. Routine blood gas analysis is not recommended as arterial puncture is painful and may cause acute decompensation. Clinical assessment is more useful than blood gas analysis. Assessment of pulsus paradoxus is no longer recommended.

IMMEDIATE MANAGEMENT

Severe asthma without life-threatening features should be treated with high-flow oxygen, nebulized salbutamol and ipratropium bromide, and oral steroids. Salbutamol and ipratropium can safely be given continuously until improvement has occurred, when the dose frequency can be reduced. Oxygen should be given before, during and after administration of inhaled bronchodilators, to avoid hypoxaemia. The safest way to do this is via an oxygen driven nebulizer rather than a holding chamber. If life-threatening features are present, senior help and an experienced anaesthetist should be summoned. In the meantime the airway should be maintained, oxygen should be administered by a rebreathing mask and intravenous access secured for administration of steroids and bronchodilators. Proven effective intravenous bronchodilators include bolus salbutamol, aminophylline, and magnesium sulphate. These should be given with cardiac monitoring, as salbutamol and aminophylline can cause arrhythmias.

INVESTIGATIONS

A chest radiograph should be obtained after initial stabilization in any child with features of severe or life threatening asthma, or with a first episode of wheeze, to exclude a foreign body, pneumothorax and mucus plugging. Routine chest radiographs in all cases of acute asthma are not necessary.

INDICATIONS FOR VENTILATORY SUPPORT

• Patients who are tired.
• Those with a reduced conscious level.
• Those who continue to deteriorate despite maximal therapy.

Blood gas analysis is not a substitute for clinical assessment and the focus should remain on the clinical state of the patient.

Intubation

The patient should be pre-oxygenated and 10–20 mls/kg colloid given electively. Patients with acute severe asthma are often volume depleted and vasodilated. Ketamine (which has some bronchodilator activity) is a useful induction agent.

Ventilation strategies

High airway resistance may lead to a very prolonged expiratory phase during artificial ventilation, and slow ventilation rates may be required (10–15 breaths per min). Blood gases should not be normalized and very high PaC02 values may be tolerated without harm ('permissive hypercapnia') provided the pH remains >7.2. Some PEEP is necessary to counteract intrinsic PEEP. Neuromuscular paralysis should be discontinued as soon as possible as the combination of steroids and paralysing agents is associated with an increased risk of critical illness neuropathy.

WHILE VENTILATED

Key in the management are generous humidification and physiotherapy to mobilize secretions and mucus plugs.

Drug treatment can include continued neuromuscular paralysis, ketamine by continuous infusion (for both sedative and bronchodilator effect) and intravenous bronchodilators such as salbutamol and aminophylline. Some inhalational anaesthetic agents also have some bronchodilator activity. Heliox (a mixture of oxygen and helium with a lower density than air) has been used to ventilate patients with very high airway resistance. Weaning from mechanical ventilation can be difficult.

CARDIAC EMERGENCIES

Cardiac emergencies in childhood are rare. **Cyanosis, cardiogenic shock and arrhythmia are the common modes of presentation.**

- **CYANOSIS**

Cyanosis in a newborn infant should raise suspicion of a right to left shunt due to congenital heart disease but can also be due to persistent pulmonary hypertension of the newborn. In later life it is possible though now extremely rare for children with missed congenital left to right shunts to develop pulmonary hypertension and for the shunt to reverse, causing cyanosis. This situation is known as **Eisenmenger's syndrome** but is now almost unheard of. Primary pulmonary hypertension can, however, can present with cyanosis in later childhood .

Any newborn child with persistent cyanosis which cannot be explained by a respiratory cause should be presumed to have a cardiac lesion. Prostaglandin E2 should be commenced to maintain ductal patency and the infant referred to a paediatric cardiology centre for further management. Prostaglandin E2 may cause apnoea and transfer may require the airway to be secured with an endotracheal tube. Well, older children presenting with cyanosis will usually have an undiagnosed cardiac or pulmonary shunt and should be referred to a paediatric cardiologist for diagnosis and management.

occur secondary to acquired disease at any time, the most common of which in childhood is viral myocarditis or dilated cardiomyopathy. However, coronary occlusion can occur in Kawasaki disease and can have a similar presentation. Infants presenting with cardiogenic shock in the newborn period should be presumed to have a duct-dependent circulation until proven otherwise and prostaglandin E2 should be commenced. The differential diagnosis includes sepsis, and infants should be commenced on broad spectrum intravenous antibiotics after blood cultures have been taken. An enlarged liver is often a clue to a cardiac diagnosis. These infants are often profoundly acidotic and may require airway support, mechanical ventilation, fluids, bicarbonate and inotropes to maintain cardiac output. Central venous access and measurement of central venous pressure is useful to optimize filling pressures. If there is any suspicion of a hypoplastic left heart or a univentricular circulation, high concentrations of inspired oxygen should be avoided as the pulmonary vascular bed can become hyperperfused at the expense of systemic circulation. Older, previously well children presenting with cardiogenic shock will require similar management but without attention to the possibility of duct dependent circulation or univentricular heart.

- **ARRHYTHMIAS**

The commonest arrhythmias in the newborn period are congenital complete heart block (often secondary to maternal SLE and transplacental carriage of anti-Ro antibodies) or supraventricular tachycardia due to an aberrant conduction pathway such as in Wolff-Parkinson-

White syndrome. In later life, supraventricular tachycardia is also the commonest arrhythmia. Ventricular arrhythmias are extremely rare in childhood and almost always due to a non-cardiac cause, for example poisoning, hyperkalaemia or acidosis.

- **SEPTIC SHOCK AND MULTI-ORGAN FAILURE**

Sepsis is 'the systemic response to infection'. This is defined by changes in temperature, heart rate, respiratory rate and white cell count. 'Septic shock' is inadequate organ perfusion in addition to the above changes. The characteristic pattern of worsening cardiovascular, respiratory and subsequently other organ system dysfunction is termed 'multiple organ failure'.
While the most extreme cases of severe sepsis are seen with gram-negative infections (classically *Neisseria meningitidis*) the pattern can be seen in response to many organisms including viruses and fungi.

INITIAL ASSESSMENT AND RESUSCITATION

The immediate care of a child with suspected septic shock must follow the principles of **A**, **B**, **C** (**A**irway, **B**reathing and **C**irculation) followed by specific therapy for the probable causative organism. Depressed conscious level (GCS ≤9), poor airway reflexes, tachypnoea and requirement for supplemental oxygen indicate impending need for assisted ventilation. Such signs will usually be accompanied by significant shock and hence induction presents a significant risk. This can be minimized by: aggressive volume replacement, pre-oxygenation, and intravenous atropine. An adrenaline bolus should be prepared and available. A range of ETT sizes should also be prepared (a good fit may be necessary to ensure adequate ventilation in the face of pulmonary oedema).
Optimal drugs for induction include fentanyl and/or ketamine. Myocardial depression agents such as thiopentone, midazolam or propofol are not good choices in children with septic shock. Rapid sequence induction may be necessary and should be performed by the most experienced staff available. Children with meningococcal disease should be orally intubated unless a coagulopathy has been excluded. The heart rate, blood pressure and capillary refill time (normal <2 seconds) should be noted and secure intravenous access obtained. If the child is in shock peripheral (or central) venous access should not be attempted for more than 90 seconds. Initial resuscitation via an anterior tibial intraosseous needle is easy and effective. A prolonged capillary refill time should be immediately treated with 20 ml/kg of intravenous colloid (e.g. 4.5% human albumin solution, Haemocel, Gelofusin) which can be safely repeated while management is continuing.

INVESTIGATIONS

These should include full blood count, clotting screen (including fibrinogen and d-dimers or fibrin degradation products to look for evidence of disseminated intravascular coagulopathy), urea and electrolytes, calcium, magnesium, phosphate, liver function tests, blood and urine for culture and rapid antigen screening and/or PCR where available.

Lumbar puncture should not be performed in children with coagulopathy or with a reduced conscious level.

FURTHER MANAGEMENT

Antibiotics

Appropriate antibiotic therapy should be commenced as soon as possible, ideally after taking blood and urine for culture. The only exception to this is in meningococcal disease, where the primary care provider may have already administered parenteral benzylpenicillin.

Circulatory support

Some children require vast amounts of fluid resuscitation: 100–200 ml/kg. Ideal subsequent management will involve the siting of central venous access to titrate fluids to maintain right heart filling pressures (usually 8–12 cmH20) to avoid pulmonary oedema. If pulmonary oedema is present it should be managed with ventilation and high-end expiratory pressure rather than diuretics. The use of FFP or packed cells as volume should be considered to correct coagulopathy and to maintain haematocrit. In the absence of CVP monitoring the effect of hepatic compression or leg elevation on BP and HR can give a rough guide to the consequences of further fluid administration.

In the presence of persistent hypotension despite adequate filling inotropic support should be initiated. The choice of inotropic agent varies but a reasonable starting regimen would be dopamine, followed by adrenaline if there is no response.

Coagulopathy

Profound coagulopathies should be treated with FFP. Low fibrinogen concentrations suggesting DIC can be replaced with cryoprecipitate. Low platelet counts in the absence of clinical bleeding should not be supplemented. More aggressive FFP therapy with or without fibrinolytic and anticoagulant therapy may be considered in the presence of severe dermal thrombosis and impending necrosis.

- **THE HEAD-INJURED CHILD**

Head injury is the major cause of death in children after infancy. The majority of cases in this age group are the result of pedestrians being struck by cars (~50%) with falls and unrestrained passenger road traffic accident injuries responsible for most of the remainder. In infancy, most serious head injuries are nonaccidental, resulting from shaking with or without an impact against a hard surface. Such mechanisms are relatively rare after 12 months of age. The majority of head injuries seen in emergency departments are minor. The probability of a serious injury is increased by a violent mechanism of injury (e.g. pedestrian versus car, fall from a height), reduced conscious level – either on history or still present on examination, any focal neurological signs and penetrating injury. A combination of these factors makes a serious injury very likely.

INITIAL ASSESSMENT AND RESUSCITATION

The initial assessment and management of the severely head-injured child follows the routine of **A** airway (and cervical spine), **B** breathing and **C** circulation. Direct airway trauma is rare but loss of the airway due to reduced conscious level and absent cough and gag reflexes is common. The child's conscious level must be assessed and any concern about the ability to protect the airway should be aggressively managed with elective intubation and ventilation to avoid hypoxaemia or hypercarbia. The airway reflexes should be assessed in all cases in which there is evidence of a reduced conscious level. All children with serious head injuries should be considered to have sustained a cervical spine injury, even in the presence of a normal lateral neck x-ray (because of the relatively high risk of ligamentous injury in childhood). Only when a child has regained full consciousness and has both a normal neurological clinical examination and no neck pain, in addition to a normal lateral neck x-ray, can cervical spine precautions be removed. If these criteria cannot be met, then the cervical spine should be immobilized and specialist neuro-radiological advice sought. Fundoscopy may reveal subhyaloid haemorrhages suggestive of a non-accidental injury. Specialist ophthalmology advice should be sought when the child is stable and appropriate clinical images taken.

Hypoventilation raises arterial carbon dioxide levels leading to cerebral vasodilatation and increased intra-cranial pressure (ICP). The aim of respiratory support in severe head injury is to avoid hypercarbia and maintain PaCO2 at 4.5–5.3 Kpa. Lower levels are detrimental and may contribute to cerebral ischaemia via excessive cerebral vasoconstriction. Hypotension must be avoided in order to maintain cerebral perfusion. Fluid resuscitation may be required, but in cases with severe cerebral oedema, inotrope or vasopressor treatment may be essential to maintain cerebral perfusion pressure (CPP). A child who has been ventilated with a severe head injury must receive both sedation and analgesia to assist in the control of raised ICP.

MANAGEMENT AFTER INITIAL STABILIZATION

Primary brain injury occurs on impact and is, as yet, untreatable. The care of the child with head injury is aimed at avoiding secondary brain injury. This can be summarized as providing a 'well-perfused and well-oxygenated brain.' Three principle mechanisms lead to the generation of secondary brain injuries: hypoxaemia, reduced cerebral perfusion and metabolic disturbances (e.g. hypoglycaemia, hyponatraemia). Raised ICP may occur due to a rapidly expanding intracranial haematoma or acute hydrocephalus resulting in a decrease in cerebral perfusion – a neurosurgical emergency. However, raised ICP is more commonly the result of diffuse cerebral oedema in children. In this scenario, the circulation must be supported to maintain cerebral blood flow. There is little consensus on the on-going intensive care management of head-injured children. Treatments commonly employed include head up 30° tilt, midline head position, sedation, analgesia, intra-cranial pressure monitoring

with circulation support (fluid and vasopressors) to maintaining cerebral perfusion pressure. Mannitol may be useful to decrease ICP prior to emergency neurosurgical intervention. The use of phenytoin as seizure prophylaxis reduces the incidence of early seizures. Hyperventilation can be harmful as it reduces cerebral perfusion and is no longer recommended. Hypertonic saline, barbiturates, hypothermia and steroids are not of any proven benefit.

- **THE CHILD WITH MULTIPLE INJURIES**

Few paediatricians will be regularly involved with the resuscitation of children with multiple injures. Such cases must be approached in a structured way (**A**, **B**, **C**) in order to identify and treat life-threatening injuries. The care of a child with multiple injuries requires careful organization and can be best achieved in large centres with all the relevant specialities available onsite (e.g. anaesthesia/ICU, radiology, orthopaedics, neurology, general, cardiothoracic, maxillofacial and plastic surgery).

INITIAL ASSESSMENT AND RESUSCITATION

This is identical to that already described for the head-injured child. As before the patient should be considered to have a cervical spine injury until they are awake and able to demonstrate normal neurology in the absence of neck pain and with a normal lateral neck x-ray. Airway assessment must include an assessment of the airway reflexes and conscious level as well as the effects of any direct trauma or foreign body.

Chest wall contusion should be noted and the possibility of fractured ribs considered. Acute tension pneumo- or haemo-pneumothorax may require emergency aspiration and drainage. Haemorrhagic shock is the main threat to the circulation in multiple trauma. The priority is early secure intravenous or intra-osseous access (ideally away from the site of obvious injuries) and fluid resuscitation of 20 ml/kg repeated as necessary. Blood samples for blood count, coagulation screen, grouping and cross-matching should be taken as early as possible. Resuscitation must continue while sites of potential blood loss are assessed in the secondary survey.

MANAGEMENT AFTER INITIAL STABILIZATION

After immediately life-threatening ABC problems have been addressed, a careful examination to detail all injuries must be undertaken. This includes log-rolling to examine the back and thoraco-lumbar spine. It is at this stage that imaging (which must include a chest x-ray and lateral neck film) appropriate to the injures (e.g. CT head, ultrasound or CT abdomen) should be performed if stability can be obtained. The management of individual injuries must be planned with the relevant surgical teams. Blood loss from fractures (especially to the pelvis or femora) is easily underestimated and often requires early fixation. Hepatic, renal or splenic injuries are all sites of potentially lethal haemorrhage though many such injuries can be managed without surgical intervention. Injury to the aorta or mediastinum requires further imaging and discussion with a cardiothoracic surgeon.

- **BURNS**

The initial management of a child with severe burns can be summarized as ‘forget about the burn. The priorities remain **A**irway, **B**reathing and **C**irculation. If the mechanism of burn is unclear or there is co-existent trauma then cervical spine precautions must be observed. Analgesia must also be addressed urgently.

GENERAL APPROACH TO THE CHILD WITH BURNS

Reduced conscious level and airway obstruction from facial or inhalational burn injury are the major causes of airway obstruction in burns. A child with facial or airway burns should be assessed for early intubation because of the high risk of swelling tissue. Smoke inhalation or reduced chest wall movement from circumferential burns must be considered. High flow oxygen should be administered to cases in which smoke inhalation is possible (to limit the effects of carbon monoxide poisoning). Large fluid losses will occur though areas of burned skin in proportion to the area affected. Complex formulae exist for calculating fluid replacement required but this should not confuse the initial management. Immediate circulation support should be as for shock from any cause with 20 ml/kg of colloid/crystalloid. If shock is present it should not be ascribed to fluid losses through the burn without considering the possibility of associated fractures, abdominal and thoracic injuries.

After the initial resuscitation, ongoing care including fluid management should be undertaken in combination with the specialized burns centre and/or paediatric intensive care unit.

DIABETIC KETOACIDOSIS

Diabetic ketoacidosis (DKA) is the common presentation of insulin dependent diabetes mellitus (IDDM) in childhood. The primary cause is insufficient endogenous or therapeutic insulin to allow adequate cellular uptake of glucose and inhibition of ketogenesis. This decompensation is frequently precipitated by an infective illness. The main clinical picture is of dehydration resulting from hyperglycaemia induced osmotic diuresis, and a profound metabolic acidosis (with an increased anion gap) from the accumulation of acidic ketone

bodies. DKA requires intensive medical and nursing input, however the vast majority of cases can be effectively managed by following some very simple rules.

INITIAL ASSESSMENT AND RESUSCITATION

As with all acutely ill children the initial assessment of a child with DKA focuses on airway, breathing and circulation. Altered conscious level on presentation is an important poor prognostic factor and should trigger the early involvement of senior help. Reduced conscious level and airway obstruction are the principal risks to the airway. Cases of DKA will be tachypnoeic as they attempt to compensate for metabolic acidosis by reducing PaCO2. A low pH (<7.0) or low PaCO2 (<2.5 kPa) indicate severe disease with a high risk of cerebral oedema. In the rare cases that require artificial ventilation for exhaustion or shock, the initial target PaCO2 must be similar to the value that the patient was achieving. This will prevent worsening of acidosis and cerebral oedema. The heart rate, blood pressure and peripheral perfusion must be regularly assessed. Shock should be treated promptly with 20 ml/kg of normal (0.9%) saline and the circulation reassessed. The possibility of a serious infection precipitating DKA must be considered. Any significant reduction in conscious level should prompt discussion with anaesthetic and/or paediatric intensive care unit staff. Cerebral oedema in DKA is unpredictable but is associated with a low PaCO2 on presentation, rapid changes in osmolarity and the use of bicarbonate solution. Treatment of cerebral oedema is essentially supportive as with raised intra-cranial pressure after head-injury. Control of PaCO2, support of the circulation and avoiding low plasma osmolarity are the main strategies. Invasive intra-cranial pressure monitoring should not be used in these cases.

INITIAL INVESTIGATIONS

These should include glucose, urea and electrolytes, bicarbonate, creatinine, plasma osmolality, liver and bone profile, FBC, PCV, arterial blood gas, urinalysis (for ketonuria and glycosuria) and partial septic screen (e.g. MSU, blood cultures). Hourly blood glucose levels should be performed. Urea and electrolytes with at least venous blood gas should be performed 2–4 hourly for the first 12 hours, and then 6-hourly for the next 12 hours. Sudden changes in glucose, osmolarity, pH and potassium levels can therefore be addressed promptly.

FURTHER MANAGEMENT

If **A**, **B**, **C** are satisfactory, the child should be assessed as follows:

Fluids

Although fluid resuscitation for shock should be undertaken promptly, there is no rush for rehydration, pH or electrolyte correction. Therefore rehydrate slowly over 48 hours with normal (0.9%) saline or 0.45% saline (if hypernatraemic). Check serum electrolytes and osmolarity two hours later and act accordingly. Place a urinary catheter, in the presence of oliguria or reduced conscious level, monitor urine output.

Insulin therapy

Once fluid replacement has commenced, the glucose level will start to reduce and a continuous infusion of rapid-acting soluble insulin (e.g. velosulin or actrapid) must be commenced. The initial dose is 0.1 units/ kg/hour, but this may need adjustment to maintain a smooth trend towards nomoglycaemia. The dose of insulin should remain at 0.1 U/kg/h until resolution of ketoacidosis. To prevent a precipitous drop in plasma glucose, glucose should be added to the inravenous fluid when plasma glucose falls to about 14–17 mmol/l.

Potassium replacement

Potassium replacement therapy should be started immediately if the patient is hypokalaemic.

If the patient is hyperkalaemic, potassium replacement therapy should be deferred until there is urine output. Otherwise, potassium should be started with insulin therapy and should continue while the patient is on intravenous fluids.

Bicarbonate replacement

Bicarbonate administration is not necessary or justified in DKA. It has been associated with an increased risk of cerebral oedema.

Nasogastric tube

A nasogastric tube should be sited in all cases with any reduction in conscious level or if there is a history of vomiting. Large volumes of gastric aspirate should be replaced with 0.45% saline plus 10 mmol/L potassium chloride.

- **STATUS EPILEPTICUS**

Generalized convulsive (tonic–clonic) status epilepticus (CSE) is defined as a generalized convulsion lasting 30 minutes or longer, or repeated tonic–clonic convulsions occurring over a 30 minute period without recovery of consciousness between each convulsion. CSE in childhood is a life threatening condition with a serious risk of neurological sequelae. Although the outcome from an episode of CSE is mainly determined by its cause, duration is also important. In addition, the longer the duration of the episode, the more difficult it is to terminate. From 0.4–0.8% of children will experience an episode of CSE before the age of 15 years, and 12% of children's first seizures are CSE. CSE in children has a mortality of approximately 4%. Neurological sequelae of CSE, such as epilepsy, motor deficits, learning difficulties, and behaviour problems, occur in 6% of children over 3 years but in 29% of children under 1 year. The consensus guideline shown here was developed by the British Paediatric Neurology Association and is primarily designed for a child presenting in the Accident and Emergency Department with an acute tonic–clonic convulsion.

RECOGNITION

Initial assessment and resuscitation should address, as always, the airway, breathing and circulation (A, B, C). High-flow oxygen should be given and the blood glucose level measured by stick testing. A brief history and clinical examination should be undertaken to confirm genuine seizure activity. Although the definition of CSE implies that the seizure should last 30 minutes, treatment should start within 10 minutes of continuous generalized tonic–clonic seizure activity. The times of drug administration in the guideline are from the time of arrival in A&E. It has been assumed that the convulsion will have been continuing for at least five minutes prior to arrival.

IMMEDIATE MANAGEMENT

If intravenous access is available, lorazepam 0.1 mg/kg should be given. Lorazepam is equally or more effective than diazepam and causes less respiratory depression. Lorazepam also has a longer duration of anti-seizure effect (12–24 hours) than diazepam (15–30 minutes). In children, when immediate intravenous cannulation has failed, rectal diazepam 0.5 mg/kg should be given. If after 10 minutes the convulsion has not stopped or another convulsion has begun, a second dose of lorazepam (0.1 mg/kg) should be given, assuming intravenous access is established. If, following the first dose of rectal diazepam, no intravenous or intra-osseous access is established and the child is still convulsing, rectal paraldehyde 0.4 ml/kg mixed with an equal volume of olive oil should be given. Arachis oil should be avoided because of the risk of peanut allergy. Intramuscular paraldehyde should be avoided because the injection is painful and there are risks of sciatic nerve damage and sterile

abscesses.
If seizure activity continues for a further 10 minutes and in the unlikely event that intravenous access is still not possible, an intraosseous needle should be inserted. Continuing convulsive activity indicates a longer acting intravenous anticonvulsant is required. Phenytoin is recommended as it causes less respiratory depression than phenobarbitone. Heart rate, ECG, and blood pressure monitoring during infusion are recommended as intravenous phenytoin can cause arrhythmias. In children already receiving phenytoin as a maintenance oral anticonvulsant, intravenous phenobarbitone should be given.

INVESTIGATIONS

Once seizure activity has ceased, a full examination including examination of the central nervous system and fundoscopy should be performed. Focal seizures or residual focal neurology suggest a structural cause for the seizures and neuroimaging may be required. Fundoscopy may reveal retinal haemorrhages suggestive of non-accidental injury. Children with no previous history of a seizure disorder who remain encephalopathic should be presumed to have an infective aetiology until proven otherwise, particularly if a fever is present, and given acyclovir, cefotaxime and erythromycin.

When intravenous or intraosseous access is obtained, blood should be sent for a full blood count, urea and electrolytes, anticonvulsant calcium and magnesium levels and blood glucose. Monitoring should include ECG, blood pressure, pulse oximetry, core temperature, blood glucose and sometimes blood gases. Appropriate specimens should also be sent for bacterial, viral and mycoplasma culture, serology and PCR. Lumbar puncture should be avoided until it is clear that intracranial pressure is not raised. Further investigation when the child is stable may include neuroimaging and neurophysiological investigation.

INDICATIONS FOR VENTILATORY SUPPORT

If, 20 minutes after intravenous phenytoin or phenobarbitone has commenced, the child remains in CSE, then rapid sequence induction of anaesthesia should be performed using thiopentone. If neuromuscular paralysis is used this should be short acting so as not to mask the clinical signs of the convulsion. At this stage, children under three years of age with a prior history of chronic, active epilepsy who present with an episode of established CSE should be treated with intravenous pyridoxine in case the seizures are pyridoxine-dependent or pyridoxine-responsive.
The child will need to be nursed on a paediatric intensive care unit (PICU) and advice on ongoing management should be sought from a paediatric neurologist.

- **POISONING**

Poisoning may occur accidentally in a young child or toddler, intentionally in teenagers or deliberately in some cases of child abuse and Munchausen syndrome by proxy.

RECOGNITION AND ASSESSMENT

Primary assessment should be directed to airway patency, adequacy of breathing and circulation and neurological status. Acidotic breathing is seen in salicylate or ethylene glycol poisoning. QRS prolongation and ventricular tachycardia are seen in tricyclic antidepressant poisoning. A depressed conscious level suggests poisoning with opiates, sedatives, antihistamines or hypoglycaemic agents. Small pupils suggest opiate poisoning but large pupils suggest amphetamines, atropine or tricyclic poisoning. Convulsions are associated with many drugs, particularly tricyclic antidepressants.

IMMEDIATE MANAGEMENT

Airway patency should be maintained, with intubation if necessary. Children with cardiorespiratory failure or a decreased conscious level should receive high-flow oxygen through a face mask with reservoir if the airway is patent. Shock should be treated with fluid boluses rather than inotropes as inotropes can cause arrhythmias in combination with some toxins. Cardiac dysrhythmias caused by poisons need specific treatment, which should be discussed with a Poisons Centre. Hypoglycaemia should be treated with intravenous 10% dextrose and convulsions treated with diazepam or lorazepam. Naloxone should be given if the pupils are very constricted or there is a history of opiate poisoning.

INVESTIGATIONS

When intravenous access is obtained, blood should be sent for a full blood count, urea and electrolytes, paracetomol and salicylate levels, toxicology, and blood glucose. Urine specimens should be collected and sent to the laboratory. Monitoring should include ECG, blood pressure, pulse oximetry, core temperature, blood glucose and sometimes blood gases.

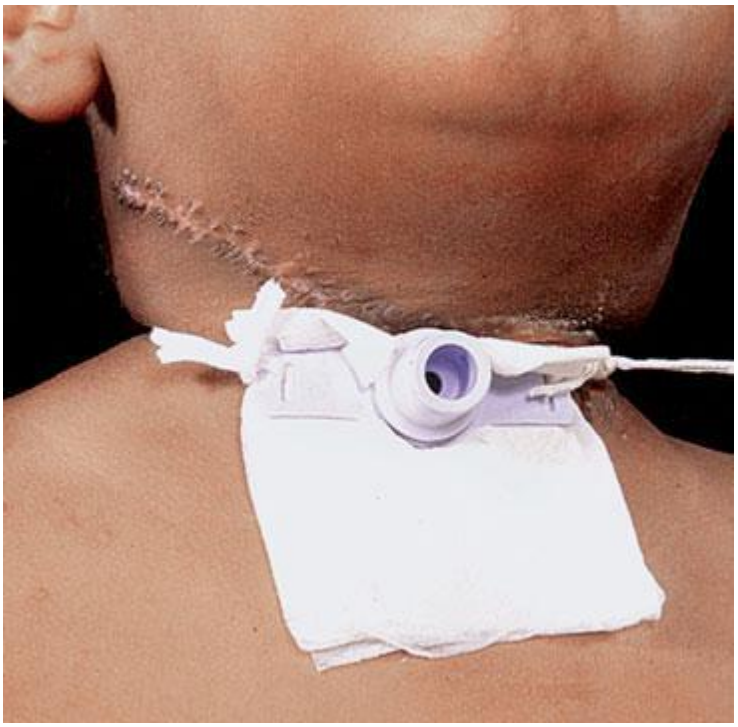
FURTHER MANAGEMENT

Gut decontamination

Activated charcoal can be given as a single dose (50 g for children over 12 years, 1 g/kg bodyweight for a child up to 12 years) up to one hour after ingestion of toxin. Beyond this time adsorption is reduced. Charcoal should not be given if the airway cannot be protected because of the risk of aspiration pneumonia. Gastric lavage should only to be used within 60 minutes of overdose and only with drugs not adsorbed to charcoal. Syrup of ipecacuanha is now rarely used as an emetic as there is no evidence that it decreases morbidity or mortality. Whole gut irrigation with polyethylene glycol should be considered when patients have ingested potentially lethal substances, such as iron or lithium, which are not adsorbed to activated charcoal, or sustained release or enteric coated preparations.

Paracetamol poisoning

N-acetyl cysteine should be given as soon as possible after a large overdose of paracetamol or if levels are toxic 4 hours after ingestion. The management of patients presenting 15 hours or more after ingestion or patients taking staggered overdoses of more than 150 mg/kg/day or 12g for a child over 12 is controversial. Advice should be taken from a poisons unit and a liver transplant unit.



Treatment Protocols

Anaphylactic shock

1. Epinephrine. Give epinephrine 0.3–0.5 mL of 1:1000 dilution intramuscularly immediately for laryngeal edema, bronchospasm, or urticaria. This may be repeated every 10–15 minutes to a total of three doses. Patients with severe hypotension, severe bronchospasm, severe upper airway edema may be administered intravenous epinephrine given as 0.5–1.0 mL of 1:10,000 dilution in bolus fashion (can be given in intervals of 5–10 minutes). If no improvement is seen, a continuous infusion of epinephrine (1–4 μg/min) titrated to effect may be administered. If IV access cannot be obtained immediately, deliver twice the above IV dose down the endotracheal tube.
2. Oxygen. Oxygen by face mask should be instituted if the patient appears dyspneic. Intubation may be required if the patient is severely somnolent or hypoxemic. Tracheostomy may be necessary if upper airway edema precludes intubation. The goal is to maintain a pulse oximetry > 90% (pO2 > 60 mm Hg).
3. Bronchodilators. Albuterol (0.5 mL of 0.5% solution in 2.5 mL of saline) can be administered by nebulizer for persistent bronchospasm.
4. Antihistamines. Diphenhydramine (Benadryl) 25–50 mg IV/IM/ PO Q 4–6 hr and ranitidine 50 mg IV or 150 mg PO Q 8 hr (or other H2 blockers) should follow epinephrine to reduce the effects of histamine release. This may alleviate hypotension as well as lessen the symptoms associated with mild urticaria.
5. Glucocorticoids. Methylprednisolone 120 mg IV × 1 dose then 60 mg IV Q 6 hr should be given in patients with anaphylactic bronchospasm. This may also help the late-phase response that sometimes occurs 6–12 hours after the initial presentation.
6. Glucagon. Patients on beta-blockers may be resistant to treatment with epinephrine and can develop refractory hypotension and bradycardia. Glucagon 1 mg IV/IM/SC bolus × 1 dose is administered for inotropic and chronotropic effects not mediated through beta-receptors.
7. Blood pressure support. Hypotension usually responds to epinephrine; however, normal saline may be necessary for patients who fail to respond, as well as glucagon, as noted above. Vasopressor medications such as continuous norepinephrine or epinephrine should be used for persistent hypotension despite aggressive fluid administration.
8. Monitoring. Telemetry or intensive care unit admission is mandatory for anaphylaxis requiring epinephrine therapy. Relapse of anaphylaxis (late-phase response) can occur hours after the initial presentation. Close monitoring through the first 24 hours is essential.
Even with rapid and appropriate treatment, patients may fail to respond. Always be prepared for the possible need for emergent intubation or tracheostomy.
VI. Prevention. Patients who have experienced anaphylaxis should be evaluated by an allergist.
A. EpiPen. Patients should be provided with, and instructed regarding the use of, a self-administered epinephrine injection device.
B. Medic Alert bracelet. Patients at risk for anaphylaxis should wear a Medic Alert bracelet at all times to expedite diagnosis and appropriate treatment in the event of subsequent anaphylaxis.

ASPIRATION

1. For patients being administered tube feedings, gastric emptying should be confirmed and the head of the bed elevated to 45 degrees. Flexible, small-bore feeding tubes are preferable to stiffer large-bore tubes. Duodenal placement of the tube may confer a reduction in risk of aspiration compared to gastric feeding.
2. Unconscious patients should be placed in a lateral, slightly head down position whenever possible.
3. When not being used for enteral feedings, nasogastric tubes should be placed only when continuous suction is required.
4. Up to one-third to one-half of patients presenting with acute cerebrovascular accidents will experience aspiration. Consider ordering video fluoroscopy in these patients to determine aspiration risk and appropriate feeding.
B. Oxygenation. Supplemental oxygen should be given in an amount sufficient to ensure oxygen saturation greater than 90%.
C. Intubation and positive pressure breathing. This is required in the patient for whom supplemental oxygen therapy is not sufficient to maintain adequate oxygenation, or in the patient who is obtunded and unable to protect her or his airway.
D. Medications
1. Bronchodilators such as albuterol 0.5 mL with 3 mL normal saline may relieve bronchospasm.
2. Prophylactic corticosteroids have not been shown to decrease subsequent morbidity and mortality from aspiration and are not indicated.
3. Prophylactic antibiotics likewise have not been shown to diminish morbidity and mortality. Antibiotics should be administered only if the patient continues to manifest fever, leukocytosis, purulent sputum, and infiltrates 2–3 days after the initial aspiration. For patients with in-hospital aspiration, a regimen that provides coverage for gram-negative aerobes and *Staphylococcus aureus* is more important than anaerobic coverage.
E. Fiberoptic bronchoscopy. This procedure is indicated when lobar or segmental collapse is present, when foreign body aspiration is suspected, or when abscess drainage is required.

BRADYCARDIA

A. Drugs
1. Consider stopping or holding doses of medications associated with bradycardia rhythms. If the patient is asymptomatic, and otherwise fine, discontinuing a medication such as propranolol is all that needs to be done.
2. Atropine. 0.5–1.0 mg IV push, up to a total dose of 2.0 mg, is the initial treatment of symptomatic sinus bradycardia. Remember to be careful in raising the heart rate of a patient with a recent myocardial infarction, because myocardial demand could increase the likelihood of precipitating further myocardial injury.
3. Since atropine is only a temporary measure, its effects are not likely to last beyond an hour or so. Transcutaneous cardiac pacing if available, dopamine 5–20 μg/kg/min, or epinephrine 2–10 μg/min can be used after atropine if the heart rate is not adequate to maintain hemodynamic stability.

4. If digitalis overdose or intoxication is responsible for a potentially life-threatening, hemodynamically unstable arrhythmia and rapid treatment is necessary, consider giving the patient intravenous digoxin immune Fab fragments (**Digibind**). The dose is based on the amount of digoxin acutely ingested or the serum digoxin concentration and body weight. See dosing charts provided with the drug.

B. Treatment of bradycardia secondary to a CNS event. Initial steps to decrease intracranial pressure include hyperventilation, furosemide, and dexamethasone if there is an increase in intracranial pressure resulting in bradycardia.

C. Temporary pacemakers. Temporary pacemakers include external and transvenous devices. External pacemakers can be applied quickly in an emergent situation such as cardiac arrest. A transvenous pacemaker should be placed using central venous cannulation and fluoroscopy when the patient is more hemodynamically stable.

1. Indications for temporary pacing

a. Mobitz type II second-degree or third-degree AV block associated with an acute myocardial infarction.

b. Symptomatic AV block associated with drug toxicity that is likely to be prolonged (amiodarone toxicity).

c. Sinus bradycardia with severe congestive heart failure.

d. Prolonged sinus pauses (> 3.5 seconds) associated with syncope.

2. Indications for permanent pacing

a. Sick sinus syndrome **with** symptoms as a result of bradycardia or sinus pauses.

b. Mobitz type II second-degree or third-degree AV block.

c. Occasionally, patients with cardiomyopathies and class III congestive heart failure may benefit from placement of a dual chambered permanent pacemaker to raise heart rate and cardiac output.

COUGH

General measures. In patients with a nonproductive cough in whom infection is not a concern, cough suppression can provide much needed symptomatic relief.

1. Cough suppression

a. Codeine phosphate is the most effective cough suppressant. The usual dose is 10–30 mg Q 4–6 hr (maximum dose is 120 mg/day). Other narcotics such as oxycodone may be likewise effective in those patients who are codeine intolerant.

b. Dextromethorphan, a codeine derivative, acts centrally and is the best nonnarcotic for cough suppression. The dose is 10–30 mg Q 4–8 hr or 60 mg Q 12 hr for sustained-action liquid (maximum dose 120 mg/day).

c. Diphenhydramine HCl acts centrally to suppress cough; the dose is 25 mg Q 4–6 hr (maximum 150 mg/day).

2. Expectorants. Have been shown to be of no value and should not be used

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DELIRIUM TREMENS (DTS): MAJOR ALCOHOL WITHDRAWAL

A. Strategies. There are four treatment strategies for minor or moderate alcohol withdrawal:

1. Supportive care. A calm environment with frequent assessment and nursing care is all that is required for many patients with *mild* alcohol withdrawal. Individuals with a history of alcohol withdrawal seizures or DTs, or a coexisting acute illness, require medical management in addition to supportive care.
2. Front-load dosing. A long-acting benzodiazepine is given every 1–2 hours until symptoms abate; for example, diazepam (Valium) 10–20 mg PO every 1–2 hours (or 5 mg IV every 5 minutes) until symptoms subside or lorazepam (Ativan) 2 mg PO every 2 hours can be used. Symptoms are alleviated faster, and the total dose of benzodiazepines required is less than the conventional scheduled dosing method.
3. Symptom-triggered dosing. The benzodiazepines are administered according to the patient's symptoms. This method requires frequent assessment using a validated withdrawal symptom scale (a common example is the Clinical Institute Withdrawal Assessment for Alcohol). Symptom-triggered therapy has been shown to require less medication and to require a shorter duration of treatment compared with scheduled dosing regimens. Initially, diazepam (Valium) 10–20 mg PO or chlordiazepoxide (Librium) 50–100 mg PO is given; or lorazepam (Ativan) 2–4 mg PO initially with additional doses every 1–2 hours if assessment indicates a need for more medication.
4. Scheduled dosing. A fixed dose of a benzodiazepine is given on a regular schedule and tapered over several days, for example, diazepam (Valium) 10–20 mg every 4–6 hours for 1–3 days, decreasing the dose by half every day. An as-needed dose of 5–10 mg every 2–4 hours is made available. Chlordiazepoxide (Librium) 50–100 mg every 6 hours can be given for 1–3 days, decreasing the dose by half every day with an additional 25–50 mg every 2–4 hours as needed. Lorazepam (Ativan) or oxazepam (Serax) PO or IM should be considered with moderate to severe hepatic dysfunction.

B. Delirium tremens

1. ICU setting
2. Thiamine replacement. Thiamine 100 mg IV or IM should be given before the administration of any IV fluids containing glucose. Glucose can precipitate Wernicke's encephalopathy in a patient with marginal thiamine stores. Thiamine should be given for at least 3 days.
3. IV fluids. May require 3–6 L per day; use D5 NS.
4. Correction of electrolyte disorders
a. Hypokalemia. Replacement with potassium supplements either PO or IV. A total replacement dose of 100 mEq of potassium is required to raise a potassium level of 3.0 mEq/L to 4.0 mEq/L. IV replacement is generally 10–15 mEq per hour. Oral replacement is 20–60 mEq per dose and can be repeated in 2–4 hours.
b. Hypophosphatemia. IV replacement is reserved for severe, life-threatening hypophosphatemia (levels < 1 mg/dL). IV replacement is with 5–10 mmol over 4–6 hours. PO replacement can be with Neutra-Phos capsules (250 mg per capsule) or skim milk (1 quart contains 1 g of phosphorus, or about 30 mmol).
c. Hypomagnesemia. Replacement is generally either IV or IM. The oral route often causes diarrhea. Magnesium sulfate can be given 1 g IM in each hip or 1 g IV per hour for 4 hours. The magnesium level should be checked 1–2 hours after the fourth gram has been infused. This regimen may need to be repeated. Magnesium is mostly an intracellular cation. With extremely low levels of magnesium, often 10–15 g are required.
5. Other vitamins. Multivitamins and folate should be given daily either orally or intravenously.
6. Restraints. Often needed to prevent injury.

7. Benzodiazepines. Diazepam (Valium) 5–10 mg IV every 5–10 minutes until sedated, or lorazepam (Ativan) 1–2 mg IV every 5–10 minutes. The dose of diazepam should not exceed 100 mg/hr or 250 mg over 8 hours.
8. Other treatments. Phenobarbital 100–200 mg IM or IV every 1–2 hours can be used if benzodiazepines cannot be used. Carbamazepine (800 mg/day, taper over 7 days) has been used for mild and moderate withdrawal as a single agent. Advantages are that it is nonaddictive and nonsedating, and metabolism is not affected by liver dysfunction.
9. Adjunct therapy. These agents are useful to treat some symptoms of withdrawal, but are ineffective at preventing delirium or seizures.
a. A beta-blocker, atenolol (Tenormin 50–100 mg/d) has been shown to be beneficial for mild to moderate withdrawal, in both outpatient and inpatient settings.
b. Clonidine (Catapres) 0.1–0.2 mg PO bid can also be used for autonomic symptoms.
c. Haloperidol (Haldol). 2–10 mg PO, IV, or IM, can be used for hallucinations or for agitation not responding to benzodiazepines. Neuroleptics decrease the seizure threshold, however, and may precipitate alcohol withdrawal seizures. Butyrophenones are a better choice than phenothiazines.
10. Antipyretics. Acetaminophen 650–1000 mg or aspirin 650 mg and a cooling blanket may be required because of fever associated with DTs.

DIARRHEA

Plan. Symptomatic treatment with fluids, electrolytes, and antidiarrheal agents is usually all that is required for acute diarrhea. The initial use of antibiotic therapy should be avoided and implemented only in specific situations and guided by stool culture results. Many cases of diarrhea resolve by addressing the underlying cause (eg, discontinuation of a drug).
A. Fluid replacement. Essential in the early treatment.
1. Oral. Helpful if given as hyperosmolar solution and with glucose to facilitate uptake of sodium and water.
2. Intravenous. Necessary if the patient is markedly volume depleted or has accompanying nausea and vomiting. Patient may need potassium replacement.
B. Diet. Place the patient on a lactose-free diet to prevent diarrhea secondary to lactase deficiency, which may be transient as a result of acute gastroenteritis. Diarrhea can also be secondary to lactose intolerance. Administer a clear liquid diet for 24–48 hours, and then advance diet slowly.
C. Antidiarrheal agents. Often helpful but should not be used if invasive diarrhea is clinically suspected. Antimotility drugs are contraindicated in patients with pseudomembranous colitis or IBD because of the risk of precipitating toxic megacolon. Commonly used agents include bismuth subsalicylate (Pepto-Bismol) 30 mL or 2 tablets Q 30 minutes to 1 hour as needed up to 8 doses/day; diphenoxylate with atropine (Lomotil 2.5 mg) 1–2 tablets qid, not to exceed 20 mg/day; and loperamide (Imodium) 4 mg initially, then 2 mg after each loose stool, not to exceed 16 mg/day. Both diphenoxylate and loperamide may facilitate development of hemolytic-uremic syndrome in patients with enterohemorrhagic *E coli.* Paregoric is an extremely effective agent (5 mL after each loose stool, up to 40 mL/day).

D. Antibiotics. Antibiotic treatment often does not shorten the duration of illness. It may select out resistant strains of organisms and may lead to pseudomembranous colitis.
1. *Salmonella.* Does not usually require antibiotics unless the patient remains ill or is predisposed to developing complications (osteomyelitis, bacteremia), such as a patient with sickle cell disease. Treatment is chloramphenicol, ampicillin, trimethoprimsulfamethoxazole (Bactrim or Septra), or ciprofloxacin.
2. Shigellosis. Antibiotics are recommended to decrease duration of illness and fecal shedding. Antibiotic sensitivity is crucial because resistance, especially to trimethoprim-sulfamethoxazole and ampicillin, is common. Treatment is an oral quinolone bid for 5 days, with trimethoprim-sulfamethoxazole or ampicillin used as a second-line therapy.
3. *Clostridium difficile.* Recommended treatment is metronidazole (Flagyl) 250–500 mg PO Q 6 hours for 10 days. If symptoms per-sist or recur, re-treatment with metronidazole is recommended. If a third course of treatment is needed, give vancomycin 125 mg PO Q 6 hours. Metronidazole is less expensive and is equally effective. Addition of cholestyramine (Questran) qid may help control diarrhea if given with antibiotics. If the patient cannot take medications orally or through a nasogastric tube, intravenous metronidazole can be used.
4. *Campylobacter.* Often self-limiting illness. With severe or persistent diarrhea, erythromycin or ciprofloxacin for 5–7 days is effective. Fluoroquinolone resistance has been reported.

FEVER

A. Initial assessment
1. Rule out hemodynamic instability.
2. Review medications. Especially looking for any recent changes.
3. Obtain appropriate cultures. Blood cultures from at least two different sites if possible.
4. Reduce patient's temperature. Give antipyretics such as acetaminophen 650 mg PO or PR. If the patient has underlying cardiac disease, the temperature should be brought down quickly to avoid cardiac decompensation.
5. Monitor for dehydration. Insensible losses increase with a fever.
6. Consider antibiotics. If the patient is *hemodynamically stable* and there is no apparent source of infection, *it is often prudent to withhold antibiotics unless the patient is immunocompromised.* As noted in the differential, the causes of fever are many and often nonbacterial. Unneeded empiric antibiotics can confuse the issue in many cases.
B. Fever with hypotension. *Septic shock is a medical emergency.* Begin fluid resuscitation with normal saline through a large-bore IV or central line, place the patient in Trendelenburg position, begin appropriate broad-spectrum antibiotics, and transfer to an ICU. The antibiotics chosen should provide coverage for gram-positive and gram-negative aerobic and anaerobic bacteria unless the source of the sepsis is obvious. If the patient's blood pressure fails to respond to fluids, begin a dopamine infusion at 2–5 g/kg/min. The use of high-dose IV steroids is warranted if you suspect addisonian crisis. Physiologic steroid replacement may be used with severe sepsis or septic shock. Decadron 10 mg IV Q 6 hr for 4 days should be given if meningitis is suspected.
C. IV catheter infection. Remove the offending peripheral IV, apply local heat, use anti-inflammatory agents if it is a peripheral site, and administer antibiotics. A first-generation

cephalosporin (cephalothin or cephalexin) or nafcillin can be used. Vancomycin should be reserved for use in suspected or culture-proven methicillin-resistant *Staphylococcus aureus* (MRSA) infection or *Staphylococcus epidermidis*. If you feel a warm, tender, swollen vein or if the patient has a history of IV drug abuse, suspect septic thrombophlebitis. Obtain a surgery consultation immediately and begin antibiotics. If a central line is in place, change all line(s) to different site(s), culture the catheter tip(s), and begin antibiotics. Gram-positive organisms are likely causes.

D. Pneumonia. Initial treatment of pneumonia should be based on results of Gram's stain and the clinical picture. Recent guidelines suggest that community-acquired pneumonia in a normal host requiring hospitalization should be treated with a fluoroquinolone (such as levofloxacin or gatifloxacin) alone OR a third-generation cephalosporin (ceftriaxone or cefotaxime) PLUS a macrolide combination OR a beta-lactam/beta-lactamase inhibitor (such as Unasyn or Zosyn) PLUS a macrolide. With a severe community-acquired pneumonia (altered mental status, pulse > 125 bpm, respiratory rate > 30 per minute, systolic blood pressure < 90, temperature < 35 °C or > 40 °C), treatment should consist of a macrolide OR fluoroquinolone PLUS a third-generation cephalosporin OR beta-lactam/beta-lactamase inhibitor combination. If *Pseudomonas aeruginosa* infection is suspected (as in a patient with cystic fibrosis), then empiric therapy should provide double coverage consisting of an antipseudomonal agent (eg, piperacillin, piperacillin-tazobactam, imipenem, meropenem, or cefepime) plus ciprofloxacin OR an antipseudomonal agent plus an aminoglycoside PLUS a respiratory fluoroquinolone OR a macrolide. If the patient is allergic to penicillin, use aztreonam PLUS a fluoroquinolone (levofloxacin, gatifloxacin, or moxifloxacin) with or without an aminoglycoside. Hospital-acquired pneumonia or pneumonia in an immunocompromised host also requires broader coverage. Antipseudomonal coverage as outlined above must be considered. Caution is advised when administering aminoglycosides to patients with renal insufficiency. A Gram's stain can also be helpful in guiding therapy. If there are gram-positive cocci in clusters, the chosen antibiotic regimen should include vancomycin until the possibility of MRSA is excluded. Be sure to adjust the dose of vancomycin with renal insufficiency.

E. Febrile, neutropenic patient. If there is evidence of infection or fever with an absolute neutrophil count (ANC) below 500/L, the patient should be pancultured immediately (body fluid cultures as indicated, eg, blood and urine) and broad-spectrum antibiotics initiated.

The specific pathogens found are almost always pyogenic or enteric bacteria or certain fungi. These are usually endogenous to the patient and include *Staphylococcus* from skin and gram-negative organisms from the GI or urinary tract. In febrile neutropenic patients who were bacteremic, one study found that 46% of the isolated organisms were gram-positive (as high as 60–70% in one reference), 42% were gram-negative, and 12% were polymicrobial. Antibiotic coverage should therefore include both gram-positive and gram-negative bacteria. One may treat with one drug, such as ceftazidime, imipenem, cefepime, or meropenem; or two drugs, such as an aminoglycoside (amikacin, gentamicin, or tobramycin) plus an antipseudomonal beta-lactam (ceftazidime, piperacillin, ticarcillin, ticarcillin plus clavulanate). An aminoglycoside may be added, depending on how toxic the patient's condition appears. Vancomycin should be added if the patient is at high risk (catheter-related infection is suspected, significant mucosal damage from chemotherapy, use of prophylactic quinolone antibiotics, septic shock or cardiovascular compromise, colonization with penicillin- or cephalosporin-resistant *Streptococcus pneumoniae* or with MRSA, and positive blood cultures for gram-positive bacteria before determination of antibiotic susceptibility). An antifungal agent (amphotericin B) should be added on day 5–7 if

the ANC remains < 500/mm3 and the patient remains febrile despite antibiotics. When using vancomycin, aminoglycosides, and amphotericin B in patients on cisplatin or cyclosporine, monitor renal function closely. Neutropenia with infection is a medical emergency requiring immediate investigation and treatment.

F. Meningitis. *Meningitis is a medical emergency.* A lumbar puncture should be done as quickly as possible, especially if the patient has no history of a bleeding disorder and no focal neurologic deficits or papilledema and if you have no reason to suspect an intracranial abscess. Begin giving antibiotics as you are doing the lumbar puncture. Decadron 10 mg IV Q 6 hr ×4 days should be administered before or with the first dose of antibiotics. If for any reason there is a delay in performing the lumbar puncture (such as obtaining a CT scan of the head because of papilledema), the antibiotics should be administered immediately and not delayed until after the procedure. A third-generation cephalosporin such as cefotaxime (Claforan) or ceftriaxone (Rocephin) should be given for meningitis of unknown etiology. Empiric therapy for meningitis should also cover for *Listeria monocytogenes* (ampicillin) if the patient is immunocompromised or over 50 years old. Vancomycin should be included if there is a high rate of penicillin-resistant pneumococcus in the community. Vancomycin and ceftazidime would be recommended for patients with a CNS shunt, recent neurosurgery, or head trauma. Otherwise, antibiotic therapy should be adjusted based on the Gram's stain. Acyclovir should be added if herpes simplex virus meningoencephalitis is suspected.

G. Cholecystitis. Obtain an ultrasound and/or HIDA scan, begin antibiotics (ticarcillin/clavulanate or gentamicin plus ampicillin plus metronidazole, OR imipenem/cilastatin) and consult surgery.

H. Drug-induced fever. Discontinue all drugs that are possibly causing a drug fever, and substitute appropriate alternatives.

I. Thyroid storm. Treat with hydration, apply cooling blanket, and give saturated solution of potassium iodide (SSKI), beta-blockers (specifically propranolol), propylthiouracil, and glucocorticoids.

J. Addisonian crisis. Treat immediately with IV steroids such as dexamethasone 4 mg for 1 dose, perform Cortrosyn stimulation test, and then begin a glucocorticoid (hydrocortisone 100 mg IV push, then 100 mg IV Q 6–8 hr). Dexamethasone does not interfere with the Cortrosyn stimulation test.

K. Malignant neuroleptic syndrome. Treatment consists of discontinuation of the neuroleptic agents, general supportive measures, and consideration of dantrolene (Dantrium) 50 mg PO Q 12 hr.

L. Uncertain or unknown diagnosis. Remember to consider pulmonary infarction and myocardial infarction.

Chest pain

A. Emergency management (for all patients with chest pain)

1. Oxygen. Administer oxygen therapy with 2–4 μL/min by nasal cannula. If the patient has a history of chronic obstructive airway disease, it is preferable to administer 24% O2 by Venturi face mask initially.

2. Intravenous access. Establish at least one intravenous line for administration of medications if the patient's condition deteriorates.
3. Nitroglycerin. If chest pain is still present and the systolic blood pressure is above 90 mm Hg, 0.4 mg nitroglycerin may be administered sublingually.
4. 12-lead ECG
5. Stat portable chest x-ray and ABGs. Obtain if your initial assessment suggests any evidence of a pneumothorax, pneumonia, or heart failure.
B. Myocardial ischemia. If your initial assessment suggests the possibility of acute MI, the following are brief guidelines offered for the initial treatment. A full discussion of acute MI is beyond the scope of this section.
1. Aspirin. Administer two chewable 81-mg aspirin (consider ticlopidine [Ticlid] if there is a history of aspirin hypersensitivity).
2. Nitrates
a. Nitroglycerin in a dose of 0.4–0.6 mg may be administered sublingually every 5 minutes, provided that the systolic blood pressure remains above 90 mm Hg. It is preferable to administer the nitroglycerin while the patient is recumbent. This may provide relief for angina pectoris and possibly unstable angina pectoris.
b. The pain of acute MI is seldom relieved by sublingual nitroglycerin and requires treatment with either intravenous nitroglycerin or morphine. If the nitroglycerin is effective but pain recurs, begin a nitroglycerin infusion initially at 10 μg/min and increase by 10 μg/min every 10 minutes until relief of pain or to a maximum dose of 200 μg/min. The systolic blood pressure must be maintained above 90 mm Hg during the administration of nitroglycerin. Hemodynamic monitoring with a pulmonary artery catheter is often necessary if hypotension develops.
3. Morphine sulfate. If pain is not relieved by nitroglycerin sublingually or intravenously, 3–5 mg of morphine IV every 5–10 minutes can be administered for relief. Close monitoring of the patient's blood pressure and respirations is necessary, because hypotension and respiratory suppression may occur. These adverse effects may be reversed with naloxone (Narcan) 0.4 mg IV.
4. Beta-blockers. Administration should strongly be considered. Metoprolol 5 mg every 2–5 minutes for 3 doses intravenously; or atenolol 5 mg every 5 minutes for 2 doses intravenously. Watch for bradycardia and acute heart block (second- or third-degree), especially in a patient with suspected right ventricular infarction.
5. Heparin. Unfractionated heparin 70 U/kg bolus, followed by 15 U/kg/hr continuous infusion. Dose is titrated to a partial thromboplastin time (PTT) 1.5–2 times the control value (usually 50–60 seconds); some cardiologists prefer the PTT to be 2–2.5 times the control value. Low molecular weight heparins may also be used. Dalteparin (Fragmin) 120 U/kg SC Q 12 hr, to a maximum of 10,000 units per dose, or enoxaparin (Lovenox) 1 mg/kg SC Q 12 hr can be used. Treatment is usually continued for 2–8 days after the patient has stabilized.
6. Transfer to a coronary care unit or intensive care. This is especially important in the first 24 hours of MI, when arrhythmia monitoring and ready access to a defibrillator are essential.
7. Platelet glycoprotein IIb/IIIa inhibitors. Should be considered in the setting of chest pain with ST depression in two contiguous leads or typical chest pain with a history of coronary artery disease. In patients undergoing percutaneous coronary intervention, abciximab (ReoPro) 0.25 mg/kg IV bolus, followed by infusion of 0.125 μg/kg/min (maximum of 10 μg/min) for 18–24 hours. Infusion should be discontinued 1 hour after percutaneous coronary intervention.

Eptifibatide (Integrilin) 180 μg/kg IV bolus, followed by infusion of 2 μg/kg/min. Eptifibatide may be administered for up to 96 hours. Tirofiban (Aggrastat) 0.4 μg/kg/min initial infusion for 30 minutes, followed by 0.1 μg/kg/min continuous infusion. Tirofiban may be given for up to 108 hours after presentation. Aspirin and heparin should be used along with the platelet glycoprotein IIb/IIIa inhibitors.

8. Thrombolytic therapy. Discussion of thrombolytic agents is beyond the scope of this section, but *should always be considered* in any patient presenting with chest pain that is consistent with MI; at least 1 mm ST-segment elevation in two contiguous leads and no contraindication to thrombolytics. See the discussions of alteplase, anistreplase, and streptokinase.

C. Aortic dissection. The initial treatment goal is to reduce pain and to reduce blood pressure if elevated. Surgical correction is indicated for all ascending thoracic aneurysms.

1. Transfer to a coronary or intensive care unit. Make arrangements for immediate transfer where hemodynamic monitoring can be instituted.

2. Immediate vascular surgical consult

3. Intravenous esmolol or labetalol. Esmolol is given as a 30-mg bolus followed by 3 mg/min and titrated to 12 mg/min. Labetalol is given as 10 mg over 2 minutes followed by 20- to 80-mg doses every 10–15 minutes to a total dose of 300 mg, and then a maintenance dose of 2 mg/min, titrating to 5–20 mg/min. If there is a contraindication to using beta-blockers, then IV verapamil or diltiazem can be used.

4. Relieve pain. Morphine sulfate 3–5 mg may be administered intravenously every 10 minutes. Again, close monitoring of the blood pressure and respirations is necessary.

D. PE

1. Oxygen. Ensure adequate oxygenation.

2. Heparin. After checking a baseline prothrombin time and PTT, administer a bolus of heparin 80 U/kg IV and follow it with a continuous IV infusion of 18 U/kg/hr. Repeat the PTT in 4–6 hours and adjust the heparin to maintain a PTT approximately 1.5–2.5 times the control value (50–70 seconds).

3. Surgical or radiologic consultation. For placement of a venocaval filter if systemic anticoagulation is contraindicated.

4. Thrombolytic therapy or surgical consultation for embolectomy. Should be considered for massive PE with hypotension.

Caution: Thrombolytics are contraindicated postoperatively.

E. Acute pneumothorax

1. Decompression. An acute tension pneumothorax should be treated by immediate placement of a 16-gauge needle into the second intercostal space in the midclavicular line. This potentially life-saving measure can be instituted while the patient awaits placement of a chest tube.

2. Oxygen. A spontaneous pneumothorax occurring in an otherwise healthy person and involving 20% or less of the lung can usually be treated with oxygen and observation. Chest tube insertion or pneumothorax catheter placement with aspiration should be used to treat all other pneumothoraces.

F. Pericarditis

1. Ketorolac (Toradol) 30 mg IM or IV initially or indomethacin (Indocin) 25–50 mg PO tid.

2. Emergent echocardiogram. If tamponade is suspected and confirmed, a cardiology consultation for pericardiocentesis should be requested.

G. Gastritis/esophagitis

1. Antacids. Mylanta-II 30 mL Q 4–6 hr may provide immediate relief.

2. H2 antagonists. Cimetidine (Tagamet), ranitidine (Zantac), famotidine (Pepcid), or nizatidine (Axid) may also relieve symptoms. Hydrogen proton pump inhibitors such as omeprazole (Prilosec) are also effective.
3. Elevating head of the bed. Elevation by 6 inches on blocks may help to reduce the reflux that occurs with recumbency.
4. *H pylori* antibody. May be helpful in making a diagnosis of peptic ulcer disease.
H. Costochondritis. Treat with NSAIDs such as ibuprofen 800 mg Q 8 hr.

HEADACHE

A. Episodic tension-type headache
1. Nonsteroidal anti-inflammatory drugs (NSAIDs). Relief of pain can usually be obtained with simple analgesics such as aspirin, acetaminophen, and NSAIDs.
2. Avoid analgesic combinations. Such as ergotamines, caffeine, butalbital, and codeine.
B. Chronic tension-type headache. This condition is notoriously difficult to manage. As with episodic tension-type headache, avoid the chronic use of narcotic analgesics, which may result in narcotic dependence. In patients with chronic tension-type headache, the treatment goals are to initiate effective prophylactic treatment and to manage any residual headaches in a manner that prevents the frequent use of analgesics and the risk for progression to chronic daily headache syndrome. Patients with chronic tension-type headache should limit their use of analgesics to two times weekly to prevent the development of chronic daily headache. Analgesics can be augmented with a sedating antihistamine, such as promethazine (Phenergan) and diphenhydramine (Benadryl), or an antiemetic, such as metoclopramide (Reglan) and prochlorperazine (Compazine). If this regimen is inadequate, the patient can try acetaminophen or aspirin combined with caffeine and butalbital. This combination is usually effective but is also the most common cause of chronic daily headache.
1. A tricyclic antidepressant. Amitriptyline (Elavil) 75 mg HS is one of the most useful agents for treating chronic tension headache. This medication should be used regardless of whether depression is overtly present. Start with 10–25 mg every night and increase the dose by 25 mg every 5–7 days to 75 mg.
2. NSAIDs. Aspirin 325–650 mg PO Q 6 hr, naproxen 275–550 mg Q 12 hr, or ibuprofen 400–600 mg PO Q 6 hr may be beneficial.
3. Selective serotonin reuptake inhibitors (SSRIs). Several of these agents (paroxetine [Paxil], venlafaxine [Effexor], and fluoxetine [Prozac]) have shown their efficacy in the prophylaxis of chronic tension-type headache in small studies.
4. Massage of the neck and local application of heat. When occipital, suboccipital, or cervical muscle spasm is present.
5. Psychotherapy, relaxation therapy, and biofeedback. May be used if preceding measures fail.
6. Smoking cessation. This is an important issue to address in patients with chronic tension-type headache.
C. Migraine headache. Several different medications are now administered in the management of acute migraine.

1. NSAIDs. For an early mild attack, treatment with a NSAID such as aspirin, ibuprofen 400–600 mg Q 4–6 hr, naproxen (Naprosyn) 550 mg Q 12 hr, tolfenamic acid, or the combination of acetaminophen, caffeine, and aspirin may be effective. Metoclopramide (Reglan) 10 mg PO can be given at this time to increase drug absorption and reduce nausea and vomiting. In addition, ketorolac, a parenteral NSAID, has been shown to be effective at 60 mg IM.

2. Ergot alkaloids

a. Dihydroergotamine. There is good evidence for the efficacy and safety of intranasal dihydroergotamine (DHE) as monotherapy for acute migraine attacks

b. *Caution:* Avoid administration of ergotamines in patients with peripheral vascular disease, coronary artery disease, hypertension, renal failure, hepatic disease, hyperthyroidism, and in pregnant patients. Do not use in patients on CYP3A4 inhibitors such as protease inhibitors, some macrolide antibiotics, or azole antifungals. Because ergot alkaloids decrease cerebral blood flow, they should be avoided in patients with complicated migraine.

3. Triptans–serotonin agonists

a. Sumatriptan (Imitrex) 6 mg SC. Other regimens and routes are available. Sumatriptan has been found to be effective in relieving headache and accompanying symptoms (nausea, vomiting, and photo- and phonophobia). It is effective even when taken late during an attack. A second dose is usually not effective.

Caution: The triptans are contraindicated in patients with known or suspected ischemic heart disease, a history of angina, ischemic or vasospastic (Prinzmetal's) angina, uncontrolled hypertension, peripheral vascular disease, recent monoamine oxidase inhibitor therapy, severe liver disease, and hemiplegic or basilar artery migraine. The safety of the triptans during pregnancy is unclear. Use with ergotamines is contraindicated.

b. Zolmitriptan (Zomig) 2.5 mg. Give 1 tablet PO at the onset of headache. Repeat at 2 hours if the headache returns, not to exceed 10 mg in 24 hours. One study has found zolmitriptan, 2.5 mg and 5 mg, to be at least as effective as sumatriptan, 25 mg or 50 mg, in the acute treatment of migraine. ***Caution:*** See above for triptans.

c. Rizatriptan (Maxalt) 5–10 mg. Give 1 tablet PO. Repeat at 2 hours if no relief. Do not exceed 30 mg in 24 hours. In patients on propranolol, use the 5-mg dose, not to exceed 15 mg in 24 hours. ***Caution:*** See above for triptans.

4. Isometheptene 65 mg/dichloralphenazone 100 mg/acetaminophen 325 mg (Midrin). Give 2 capsules at onset of headache followed by 1 capsule Q 1 hour to maximum of 5 capsules in 24 hours.

5. Prochlorperazine (Compazine) 25 mg IV. This medication has been shown in some controlled trials to be superior to DHE in migraine relief.

6. Prophylactic therapy. Several medications can be used for prophylaxis of migraine, including propranolol 80–240 mg/day, timolol 20–30 mg/day, amitriptyline 30–150 mg/day, divalproex sodium 500–1500 mg/day, and sodium valproate 800–1500 mg/day. These medications are less useful in the management of an acute migraine and do not receive further discussion here.

D. Cluster headaches

1. Oxygen. Inhalation by face mask at 7 L/min for 10 minutes has been reported to be successful in aborting a cluster headache. Greatest benefit is obtained in patients < 50 years with episodic cluster headache.

2. Sumatriptan. Found to be effective in aborting cluster headache in some patients and is administered as described above for migraine headaches.

3. Zolmitriptan. 10 mg PO has been reported as being well tolerated and shown to be significantly superior to placebo in episodic cluster headache patients.
4. Prophylactic therapy. Verapamil, lithium carbonate, methysergide and cortisone are the standard of care for preventive therapy of cluster headache. Some recent observations indicate that valproic acid, topiramate, gabapentine, naratriptan and the local application of civamide or anesthesia of the greater occipital nerve may be effective in cluster headache.

HEMATEMESIS, MELENA

Monitoring. The first step in management is to determine whether the patient should be monitored in an ICU. The following are guidelines for admission to the ICU.
1. Clearly documented frank hematemesis.
2. Coffee-ground emesis *and* either melena or hematochezia.
3. Hemodynamic instability, either hypotension, tachycardia, or orthostatic hypotension.
4. A drop in hematocrit of 5 points after fluid resuscitation.
5. A significant unexplained increase in the BUN when GI bleeding is suspected.
6. High-risk patient: advanced age, inpatient status at time of bleed, recurrent or evidence of persistent bleeding, major comorbidity (hepatic, renal, pulmonary, or cardiac disease).
B. Volume resuscitation. If massive bleeding is evident, place two large-bore (14- or 16-gauge) IV lines. Begin IV fluids containing normal saline at a rate to maintain hemodynamic stability. Transfuse PRBCs when available for massive bleeding to keep the hematocrit above 30%. With massive bleeding, consider transfusing typed non—cross-matched blood.
C. Surgical consultation. Essential in the management of upper GI tract hemorrhage. It should be obtained within the first few hours of the patient's arrival. If hemodynamic stability cannot be achieved, immediate surgical intervention may be necessary.
D. Specific treatment. The management of various sources of upper GI hemorrhage depends on the diagnosis.
1. PUD. Pharmacologic therapy with proton pump inhibitors has recently been shown to help prevent rebleeding. Pantoprazole is the only proton pump inhibitor with an IV form available in the United States. H2-receptor antagonists (ranitidine [Zantac], cimetidine [Tagamet], and famotidine [Pepcid]) are not recommended for acute hemorrhage. Endoscopic therapies are effective for controlling bleeding and preventing rebleeding. They include thermal probe, injection therapy, electrocoagulation, and laser. If evidence of *Helicobacter pylori* infection is present (positive rapid urease test, histology, antibody or breath test), treatment with appropriate antibiotics is indicated.
2. Acute hemorrhagic gastritis or esophagitis. Acid reduction therapy.
3. Mallory-Weiss tear. No specific therapy beyond supportive care. Thermal or electric probes have been used successfully.
4. Esophageal varices. Give octreotide bolus of 25–50 μg, followed by a continuous infusion of 25–50 μg/hour. If octreotide fails, then balloon tamponade should be considered. Endoscopic therapies include band ligation (preferred) and injection sclerotherapy.
5. Aortoenteric fistula. Surgical intervention is necessary.

HEMATURIA

Treatment depends on the cause. Keep in mind that apart from gross hematuria with or without clots (trauma, severe coagulopathy, cyclophosphamide- induced hematuria), the causes of hematuria are rarely emergencies; a thoughtful and careful evaluation can therefore be pursued over several days.

A. Urinary tract infection. The infection must be eradicated and a repeat urinalysis performed to rule out continued hematuria. If hematuria persists, further evaluation is necessary.

B. Urolithiasis. If the stone is expected to pass spontaneously (usually < 1 cm) and there are no complicating factors (infection, obstruction), expectant therapy with analgesics and hydration is appropriate. The urine should be strained.

C. Neoplasms. A complete urologic evaluation is recommended for assessing gross hematuria.

D. Tuberculosis. Treat appropriately with antibiotics. Initial therapy is usually with isoniazid (INH) 300 mg PO Q day, rifampin 600 mg PO Q day, and pyrazinamide 15–30 mg/kg with a maximum dose of 2 g Q day and ethambutol 15–25 mg/kg/day. The American Thoracic Society and the Centers for Disease Control and Prevention recommend a four-drug regimen for treatment until the results of drug susceptibility studies are available; or unless there is < 4% primary resistance to INH within the community. If so, an initial three-drug regimen is recommended. Long-term follow-up with IV pyelograms is necessary, because strictures are late sequelae and can lead to obstruction.

E. Collecting system abnormality. Usually requires surgical referral and repair.

F. Coagulopathy. Correct clotting factor deficiencies or adjust anticoagulant dose. Frequently, the coagulopathy induces bleeding from a preexisting abnormality. A thorough evaluation is usually indicated in a patient who has hematuria and a coagulopathy.

G. Glomerulonephritis. Most cases require a biopsy for definitive diagnosis, with therapy as appropriate for the underlying illness.

H. Hemorrhagic cystitis. Treat with continuous saline irrigation and occasionally a 1% alum irrigation. Also, hyperbaric oxygen can be used. The primary treatment is prevention, which includes hydration (oral or intravenous) and mesna (Mesnex).

JAUNDICE

The tempo of diagnostic evaluation is dictated by the severity of the patient's illness. If acute cholangitis is suspected, the evaluation must proceed emergently. Patients with signs of liver failure, including significant coagulopathy-hepatic encephalopathy, acidosis, and renal failure, require management in an ICU. Early indentification of these patients and referral to a liver transplantation program emergently are key parts of appropriate care.

A. Medical: hepatocellular cholestasis

1. Viral hepatitis. Patients who are dehydrated or vomiting or have significant coagulopathy need admission for treatment with IV fluids, vitamin K, and fresh-frozen plasma.

2. Alcoholic liver disease. Requires aggressive supportive care, entailing dietary restriction of protein, full evaluation of any coagulopathy, and treatment of associated electrolyte deficiencies that are often encountered in alcoholics (eg, hypokalemia, hypomagnesemia, and hypophosphatemia). Thiamine, folate, and multivitamins may be needed. In a patient with ascites, a paracentesis should be performed. With ascites, prophylactic antibiotics are recommended to prevent peritonitis if the total protein in the ascitic fluid is < 1 g/dL or if the

patient had a previous episode of spontaneous bacterial peritonitis. Norfloxacin 400 mg per day; ciprofloxacin 750 mg per week; or trimethoprim-sulfamethoxazole DS, 1 pill per day, 5 days per week should be given indefinitely.

B. Surgical: extrahepatic cholestasis. Extrahepatic biliary obstruction can be conceptualized in two forms: chronic and acute.

1. Chronic extrahepatic cholestasis. Usually accompanied by biliary ductal dilation, which can be demonstrated by various techniques.

2. Acute biliary obstruction. Jaundice due to acute biliary obstruction, usually by a gallstone, can be more difficult to evaluate. Noninvasive imaging studies such as ultrasound or CT fail to reveal evidence of obstruction in 25–75% of such cases. The diagnosis of extrahepatic obstruction is frequently suggested by accompanying clinical features such as right upper quadrant pain, fever, sepsis, and the presence of cholelithiasis. Although noninvasive tests are usually the first line of imaging, if clinical suspicion of acute extrahepatic biliary obstruction is high, proceeding with ERCP first may be appropriate. ERCP is both a diagnostic and therapeutic modality in this setting. If ERCP fails, percutaneous drainage of the biliary tract can be attempted.

C. Hemolysis. Treat underlying cause.

JOINT SWELLING

Plan. Treatment depends on the type of arthritis diagnosed. An individual discussion of each type is beyond the scope of this book.

A. Drug therapy. Ensure from the patient's history and laboratory tests that there are no contraindications to the medication chosen. The patient must be informed of side effects. The most commonly prescribed medications (NSAIDs) are contraindicated in patients with elevated creatinine, a history of hypersensitivity reaction to aspirin or NSAIDs, platelet abnormalities, and possibly peptic ulcer disease. In the elderly, one must be aware of the CNS side effects. The selective COX-2 inhibitors (rofecoxib [Vioxx] and celecoxib [Celebrex]) are less likely to cause gastrointestinal toxicity. The COX-2 inhibitors, however, have the same renal toxicity as other NSAIDs. Avoid using celecoxib in patients with an allergy to sulfa drugs.

B. Supportive measures. Depending on the diagnosis, heat or ice therapy, specific exercises, splinting, and physical therapy may be indicated.

C. Septic arthritis

1. Daily drainage of joint fluid is absolutely necessary. If the joint is not easily drained, open drainage may be necessary. Gram's stain helps to direct the initial choice of antibiotic pending cultures.

2. If gonococcal arthritis is suspected, ceftriaxone should be given.

3. In nongonococcal bacterial arthritis, gram-positive cocci on Gram's stain should be treated with a penicillinase-resistant penicillin or vancomycin if methicillin-resistant *Staphylococcus aureus* is prevalent or if *Staphylococcus epidermidis* is suspected. An aminoglycoside and an antipseudomonal penicillin or third-generation cephalosporin would be used for gram-negative bacilli. If the Gram's strain is negative in a compromised host, use broad-spectrum coverage for both gram-positive and gram-negative organisms.

WHEEZING

Treatment depends on the diagnosis. The preceding differential diagnoses and studies should enable you to form a tentative categorization on which to base initial therapy.

A. Bronchospasm (asthma, COPD, allergic reaction)

1. Methylprednisolone (Solu-Medrol). Give 60–125 mg IV Q 6 hr.

2. Nebulized albuterol. Give 0.5 mL of 0.5% solution (2.5 mg) in 2.5 mL normal saline stat and every 20 minutes for 3 doses, then every 1–4 hours as needed. Alternatively, four puffs albuterol metered- dose inhaler via spacer device may be given every 20 minutes up to 4 hours (12 doses), then every 1–4 hours as needed.

B. Stridor

1. Methylprednisolone 40 mg IV stat dose

2. Nebulized racemic epinephrine. Give 0.5 mL in 3 mL normal saline.

3. Continuous positive airway pressure (CPAP). Give 10–15 cm H2O applied continuously; if ventilatory failure is suspected, consider bilevel positive airway pressure (BiPAP) instead at 15/10 cm H2O.

4. Intubation or tracheostomy. If there is no response to the above measures.

C. Pulmonary edema

1. Furosemide (Lasix) 20–80 mg IV

2. Nitroglycerin. Give 0.4 mg sublingually, or paste 1⁄2 inch on skin, or nitroglycerin drip 10–20 μg/min and increase by 5–10 μg every 10 minutes.

3. Afterload reduction. Use agents such as IV nitroprusside (Nipride), or oral agents such as captopril (Capoten) or enalapril (Vasotec), or any other ACE inhibitor.

4. Intravenous morphine. For venodilation and to relieve anxiety. Morphine may suppress respiratory drive and cause further respiratory compromise, necessitating intubation.

5. Oxygen. Start with 100% oxygen by nonrebreather mask, as long as the patient is not a carbon dioxide retainer.

6. CPAP (10 cm) or BiPAP (12/8 cm). Recently proven efficacious in acute pulmonary edema.

D. Miscellaneous disorders. Treatment varies with the disease. PE should be treated with anticoagulants. Suspected tumors require additional tests such as bronchoscopy before reasonable treatment can be initiated.

SEIZURES

Support life functions with the ABCs (airway, breathing, and circulation) of cardiopulmonary resuscitation and protect the patient from self- inflicted injury during the seizure.

A. Emergency management. Place the patient in a lateral decubitus position with a suction device to prevent aspiration if vomiting occurs. Move objects away from the patient or place padding between the patient and the floor or other immovable items. Do not place objects in the patient's mouth or try to force the mouth open because these measures are unnecessary and may lead to injury to the patient or yourself.

B. Seizure control.

1. Most seizures are self-limited, last no more than 2–3 minutes, and may not need immediate treatment until a detailed evaluation is completed. *Status epilepticus* is recurrent seizures without complete recovery between seizures. Any seizure type can evolve into status epilepticus, but generalized tonic-clonic status epilepticus is a medical emergency requiring prompt treatment to prevent serious morbidity and mortality. In clinical practice, a generalized tonic-clonic seizure

lasting more than 5–10 minutes or two generalized tonic-clonic seizures occurring in quick succession without the patient fully recovering between seizures should be treated as status epilepticus.

2. Immediately establish IV access and collect a serum specimen for laboratory tests. If hypoglycemia is a suspected cause, do not wait for the results of the laboratory tests. Promptly give 50 mL of 50% dextrose IV. If there is clinical suspicion of chronic alcohol abuse or another disorder associated with nutritional deprivation, give 50 mg thiamine IV with dextrose to prevent precipitation of Wernicke's encephalopathy.

3. For generalized tonic-clonic status epilepticus with the patient in an active seizure, give lorazepam 0.1 mg/kg at 1–2 mg/min IV, and repeat, if necessary, in 15 minutes (maximum dose 0.2 mg/kg or 5–10 mg total; doses > 0.2 mg/kg are usually unnecessary or ineffective). Diazepam may also be used at doses of 5–10 mg at 1–2 mg/min IV, and repeated, if necessary, in 15 minutes (maximum dose 20–40 mg). However, lorazepam may be preferred because of its longer effect. Both drugs may cause respiratory depression (especially if given with phenobarbital) and may require intubation and ventilatory support.

4. If the patient is in status epilepticus but not in an active seizure, fosphenytoin can be given to prevent further seizures by loading intravenously with 15–20 mg phenytoin equivalents (PE)/kg at 100–150 mg PE/min. PE may also be used intravenously with a loading dose of 15–20 mg/kg but must be given at slower rates of ≤50 mg/min to avoid significant hypotension. PE extravasation can cause severe skin sloughing. Another option would be to load with IV valproate at doses of 15–20 mg/kg at 1.5–3 mg/kg/min. Phenobarbital with a loading dose of 10–20 mg/kg at 50–100 mg/min IV (maximum dose of 1.5–2 g) may be added if seizures recur with maximal doses of fosphenytoin, PE, or valproate.

5. If you are unable to immediately secure an IV access and the patient is in an active seizure, diazepam rectal gel may be given at a dose of 0.2 mg/kg (maximum 20 mg). Midazolam may be given IM at a dose of 0.07–0.08 mg/kg (approximately 5 mg), or fosphenytoin can be given IM at a dose of 15–20 mg/kg.

6. Generalized tonic-clonic status epilepticus refractory to the above measures may require general anesthesia with an agent such as pentobarbital (by this time neurologic consultation and emergency EEG are necessary to exclude psychogenic seizures or other disorders that may masquerade as refractory status epilepticus). The loading dose for pentobarbital is 15–20 mg/kg IV at 25–50 mg/min. Additional doses of 25–50 mg every 2–5 minutes may be given until a burst suppression pattern appears on EEG recording; then, a continuous infusion is maintained at 1–2 mg/kg/hr. The patient must be intubated, and a central venous pressure monitor is required to monitor volume status. Dopamine or dobutamine drips may be necessary to treat hypotension because of the cardiac depressant effects of pentobarbital. Other options for refractory status include IV midazolam 0.2 mg/kg bolus, maintained at 0.75–10 μg m/kg/min; or IV propofol 1–2 mg/kg bolus, maintained at 2–10 mg/kg/hr. Continuous EEG monitoring is maintained throughout the pentobarbital coma to identify development of subclinical status epilepticus.

7. Complications from generalized tonic-clonic status include acute myocardial infarction, rhabdomyolysis, acute renal failure, aspiration pneumonia, pulmonary edema, hyperkalemia, severe acidosis, compression fractures, and trauma. These complications should be anticipated, closely monitored, and treated early to minimize their effects.

8. Admit the patient for observation and treatment if he or she has had status epilepticus, first generalized tonic-clonic seizure, associated disorder requiring hospitalization (eg, acute stroke, brain edema, meningitis, drug toxicity). Patients with a history of epilepsy do not necessarily

require admission if a source of their breakthrough seizure is found and corrected (eg, subtherapeutic anticonvulsant level due to incomplete compliance) or if the seizure type would not predict serious harm to the patient if released from the hospital (eg, absence or brief myoclonic seizure, or some complex partial or simple partial seizures).

9. Not all isolated seizures need to be treated with an anticonvulsant. Epileptic seizures due to alcohol or drug withdrawal, drug abuse, severe sleep deprivation, or seizures associated with acute illness such as hypoglycemia do not need to be treated. If the patient has a history of brain injury, a structural lesion of the brain such as a tumor or arteriovenous malformation, or an abnormal EEG with epileptiform activity, or if the presentation with status epilepticus is at the onset, treatment with an anticonvulsant to prevent further seizures is recommended.

CONSTIPATION

Plan. Once the cause is determined, the underlying cause should be corrected. Medicines inducing constipation should be discontinued whenever possible. Electrolyte abnormalities should be corrected or obstruction relieved.

A. Prevention. Patients taking narcotics should receive stool softeners and bowel stimulants. Bedridden patients should also be given stool softeners. Place patients on high-fiber diets; encourage activity and adequate fluid intake.

LAXATIVES.

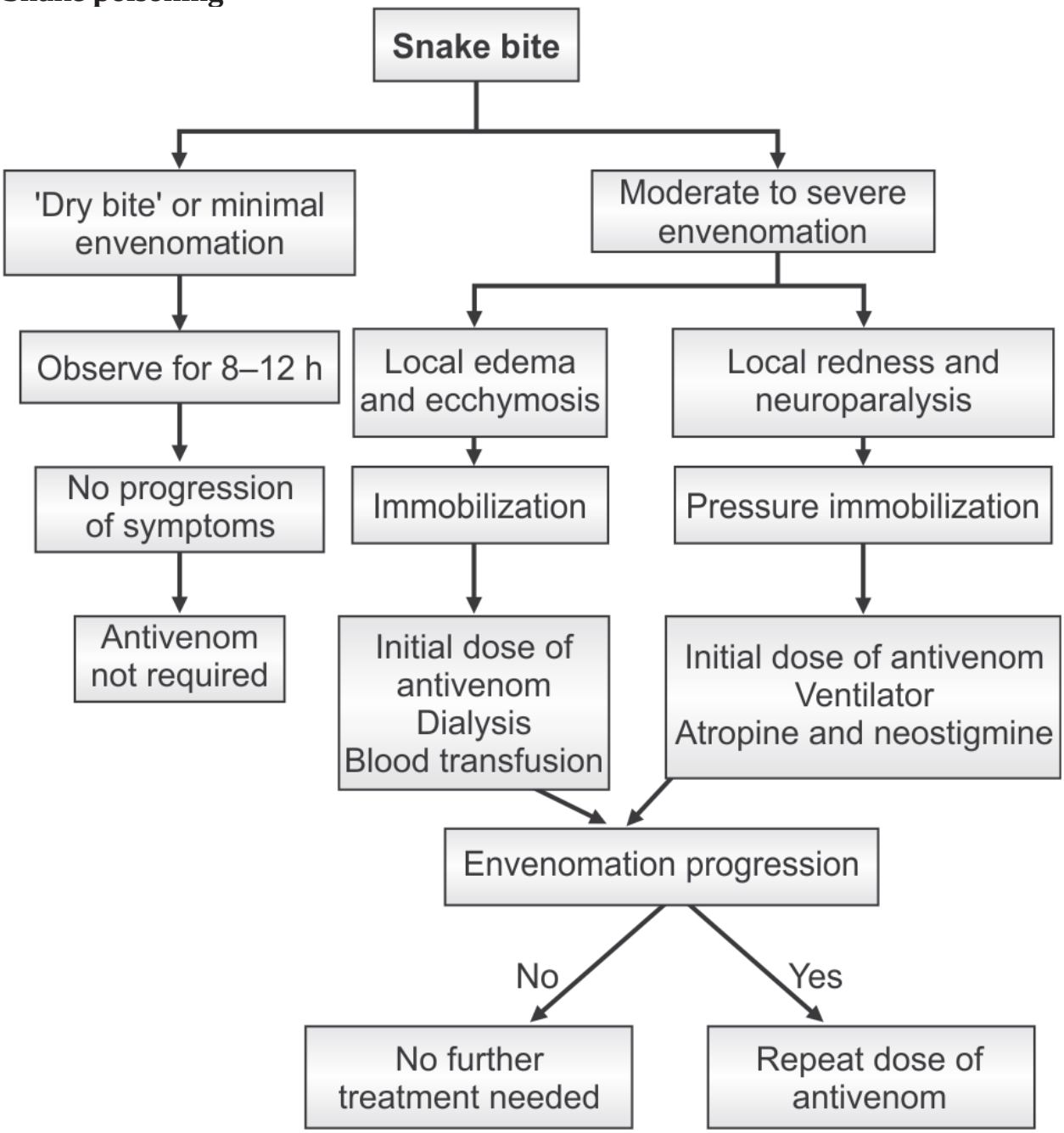
a. Bulk—daily use
   1 teaspoon (6–7 g) in fluid 1 or 2 · daily

b. Softeners/wetting agent : 50–200 mg 1 or 2 ·daily
   Available: Capsules 50–100 mg
   Solution 10 mg/mL
   Syrup 25 mg/mL

c. Stimulants—prn
   - Bisacodyl (Dulcolax) Oral 5–15 mg, 5-mg tablets
     Rectal 10 mg, 10-mg suppository
   - ♦ Senna (Senokot) 1 tablet 1 or 2 · daily
   - ♦ Glycerin suppository 3 g; 1 rectally

d. Osmotic—prn
   Milk of Magnesia 15–30 mL 1 or 2 · daily
   Magnesium citrate 200 mL; one-time dose
   Polyethylene glycol (PEG) 17 g in fluid 1 or 2 · daily

Snake poisoning



Antivenom Treatment

- The lyophilized **polyvalent antisnake venom (ASV)** serum available is effective against common poisonous snakes (cobra, common krait, saw scaled viper and Russell's viper)
- *Dose:* Freeze-dried (lyophilized) antivenom serum is dissolved in water (10 ml vial). About 80–100 ml serum should be diluted in 200–500 ml of isotonic saline and given slow IV.
- The recommended initial dose of ASV is 8–10 vials administered via IV route over a period of 1 h. Repeat doses for vasculotoxic species is based on the 6 h rule (depending

on the coagulation profile); maximum recommended dose is 30 vials. Repeat doses for neurotoxic is based on the 1– 2 h rule (depending on whether patients have not improved, or worsened); maximum dose is 20 vials. However, evidence-based medicine found no difference in the outcome in low-dose ASV regimen to standard recommended dose.

- Antivenom treatment should be given as soon as it is indicated.
- ***Contraindications****:* There is no absolute contraindication to ASV treatment.
- ASV should not be used indiscriminately because it carries a risk of severe adverse reactions, and is costly and may be in limited supply.
- Patients must be closely observed for at least 1 h after starting IV antivenom, so that early anaphylactic reactions can be detected.
- Snakes inject the same dose of venom into children and adults. Children must therefore be given exactly the same dose of ASV as adults.

Supportive Treatment

Ventilatory care

- Patient should be nursed in lateral position, and salivation should be cleaned timely to prevent aspiration.
- Endotracheal intubation, O2 supplementation and tracheostomy may be needed in neuroparalytic bite.

Antibiotics

- Broad spectrum antibiotics should be given, if there is wound infection.
- Tetanus toxoid or tetanus immunoglobulin of human origin is given.

Surgical excision:

- Early surgical intervention is needed to prevent extension of infection and development of gangrene. Surgical debridement of necrotic tissue is helpful, but the use of fasciotomy is highly questionable. Fasciotomy does not remove or reduce any envenomation. It is indicated only for compartment syndrome.

Anticholinesterase (ACE) ***('Tensilon'/edrophonium test):***

- ACE is effective and safe in elapid bite.
- Atropine (0.6 mg in adults and 50 μg/kg in children) is given IV (to prevent undesirable muscarinic effects of acetylcholine, such as increased secretions, sweating, bradycardia and colic) followed by an IV injection of edrophonium chloride (10 mg in adults, 0.25 mg/kg in children) or neostigamine (0.01–0.04 mg/kg every 1–3 h).22
- Patient can be then maintained on neostigmine (50-100 mg/kg) and atropine (4 hourly continuous infusions).

Hypotension and shock

- Fluid resuscitation with normal saline or Ringer's lactate should be initiated.
- Plasma expander, 5% albumin (10–20 ml/kg), fresh whole blood or fresh frozen plasma should be infused, if CVP is low.
- Dopamine (starting dose 2.5–5 μg/kg/min IV) can be given.

Oliguria and renal failure

- Cautious rehydration, diuretics (furosemide) or dopamine should be tried in case urine output drops to < 400 ml/24 h.
- Hemofiltration or peritoneal or hemodialysis, as indicated (acute renal failure seen in vasculotoxic bite).

Hemostatic disturbances

- Fresh blood, fresh frozen plasma, cryoprecipitate or platelet concentrates, as needed in viperine snakebites.
- Heparin 1000–5000 IV may be given, if there are clotting abnormalities (e.g. DIC). Use of heparin should be weighed against risk of bleeding, and hence caution is advocated.

Corticosteroid therapy: No beneficial effects.

Reference: Forensic medicine and Toxicology By Dr. Furqan Ali Khan.

Gastritis

H-pyloric gastritis

H. pylori eradication: All patients with acute or chronic duodenal ulcer disease and those with gastric ulcers who are *H. pylori*-positive should receive eradication therapy. This heals ulcers, prevents relapse and eliminates the need for long-term treatment in > 90% of patients. A PPI is taken with two antibiotics (from amoxicillin, clarithromycin and metronidazole) for 7 days. First-line therapy is a PPI (twice daily), clarithromycin 500 mg twice daily, and amoxicillin 1 g twice daily or metronidazole 400 mg twice daily, for 7 days. Compliance, side-effects (usually diarrhoea, nausea, vomiting) and metronidazole resistance influence success rates.

Patients who remain infected after initial therapy should be offered **second-line therapy**. For those who are still colonised after two treatments, the choice lies between a third attempt (guided by antibiotic sensitivity testing) and long-term acid suppression. *H. pylori* and NSAIDs are independent risk factors for ulcers, and patients requiring long-term NSAID therapy should first undergo eradication therapy to reduce ulcer risk. Subsequent co-prescription of a PPI with the NSAID is advised but is not always necessary for patients being given low-dose aspirin.

General measures: Cigarette smoking, aspirin and NSAIDs should be avoided. Alcohol in moderation is not harmful and no special dietary advice is required.
Maintenance treatment: This should not be necessary after successful *H. pylori* eradication.
Surgical treatment: Surgery is now rarely required for peptic ulcer, unless there is perforation, persisting haemorrhage, gastric outflow obstruction or persisting or recurrent ulcer after medical
treatment. Non-healing gastric ulcer is treated by partial gastrectomy, in which the ulcer and the ulcer-bearing area of the stomach are resected to exclude an underlying cancer. In the emergency
situation, biopsies are taken, and then 'under-running' the ulcer for bleeding or 'oversewing' (patch repair) for perforation is sufficient.

Medication and Doses	**Comments**
Clarithromycin (500 mg bid), amoxicillin (1g bid), and PPI	1st line therapy
Metronidazole (500 mg bid), amoxicillin (1g bid), and PPI	1st line therapy in setting of prior macrolide exposure.
Clarithromycin (500 mg bid), metronidazole (500 mg bid), PPI	1st line therapy for penicillin allergic patients
Amoxicillin (1 g bid) and PPI for 5 days, followed by clarithromycin (500 mg bid), metronidazole (500 mg bid), and PPI for another 5 days	Sequential therapy
Tetracycline (500 mg qid), metronidazole (250 mg qid), bismuth (525 mg qid), and PPI	Bismuth containing quadruptle therapy, salvage regimen
Levofloxacin (250 mg bid), amoxicillin (1g bid), and PPI	Levofloxacin- based triple therapy, salvage regimen
Two antibiotics selected by sensitivity test on culture, bismuth (525 mg qid), and PPI	Culture guided therapy (if failed multiple regimen)

Reference:

- Davidson medicine
- Harrison medicine
- Oxford handbook of clinical medicine
- Oxford handbook of clinical speciality

- First aid USMLE 2018.

Gynecology and Obstetrics

Hemolytic disease of the newborn:

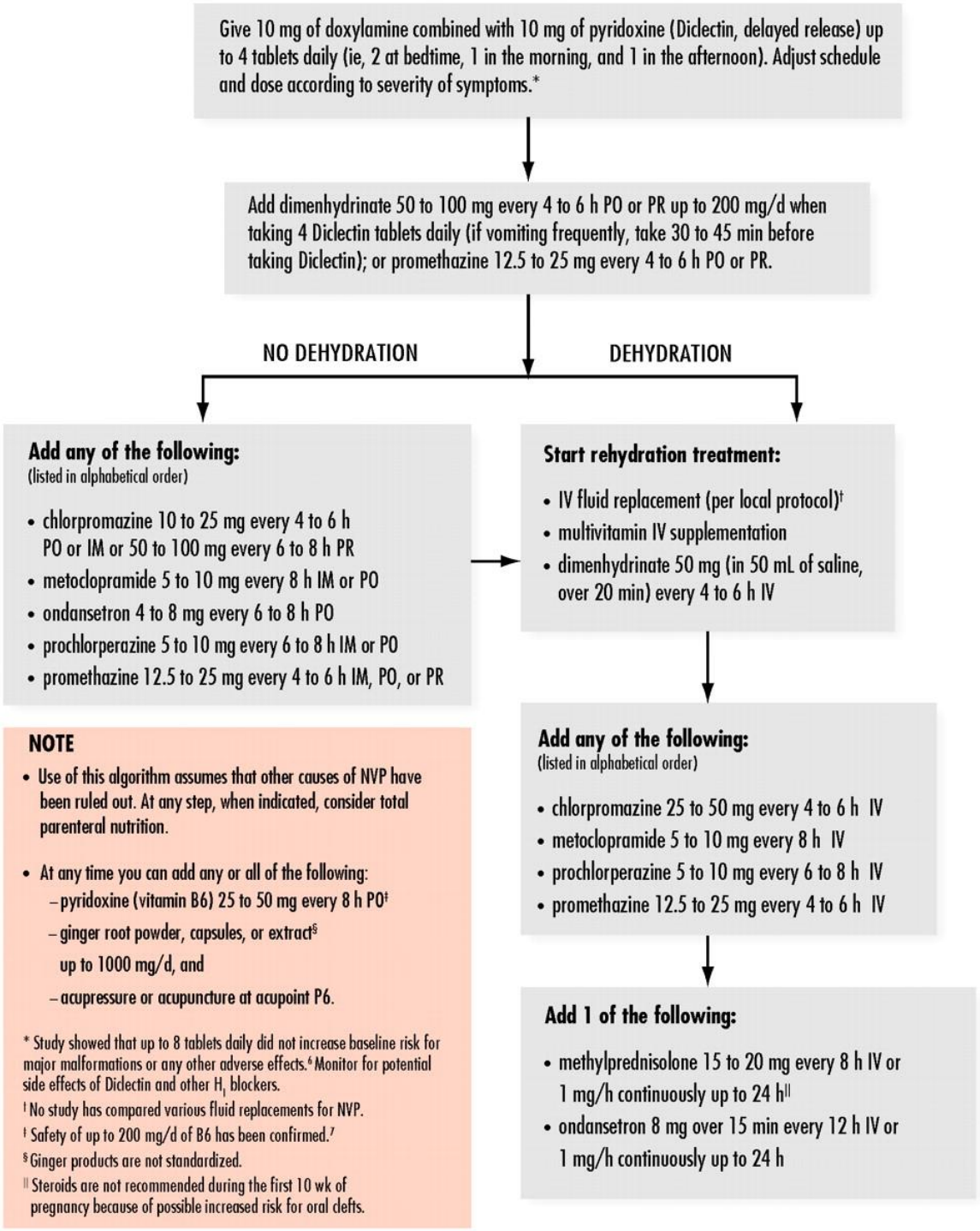
- Also known as erythroblastosis fetalis.

	Rh hemolytic disease of the newborn	ABO hemolytic disease of the newborn
Interaction	Rh ⊖ mothers; Rh ⊕ fetus.	Type O mothers; type A or B fetus.
Mechanism	First pregnancy: mother exposed to fetal blood (often during delivery) →formation of maternal anti-D IgG. Subsequent pregnancies: anti-D IgG crosses the placenta →HDN in the fetus.	Pre-existing maternal anti-A and/or anti-B IgG antibodies cross placenta→HDN in the fetus.
Presentation	Jaundice shortly after birth, kernicterus, hydrops fetalis.	Mild jaundice in the neonate within 24 hours of birth. Usually less severe than Rh HDN.
Treatment and prevention	Prevent by administration of anti-D IgG to Rh ⊖ pregnant women during third trimester and early postpartum period (if fetus tests	Treat newborn with phototherapy or exchange transfusion.

	⊕ for Rh). Prevents maternal anti-D IgG production.	

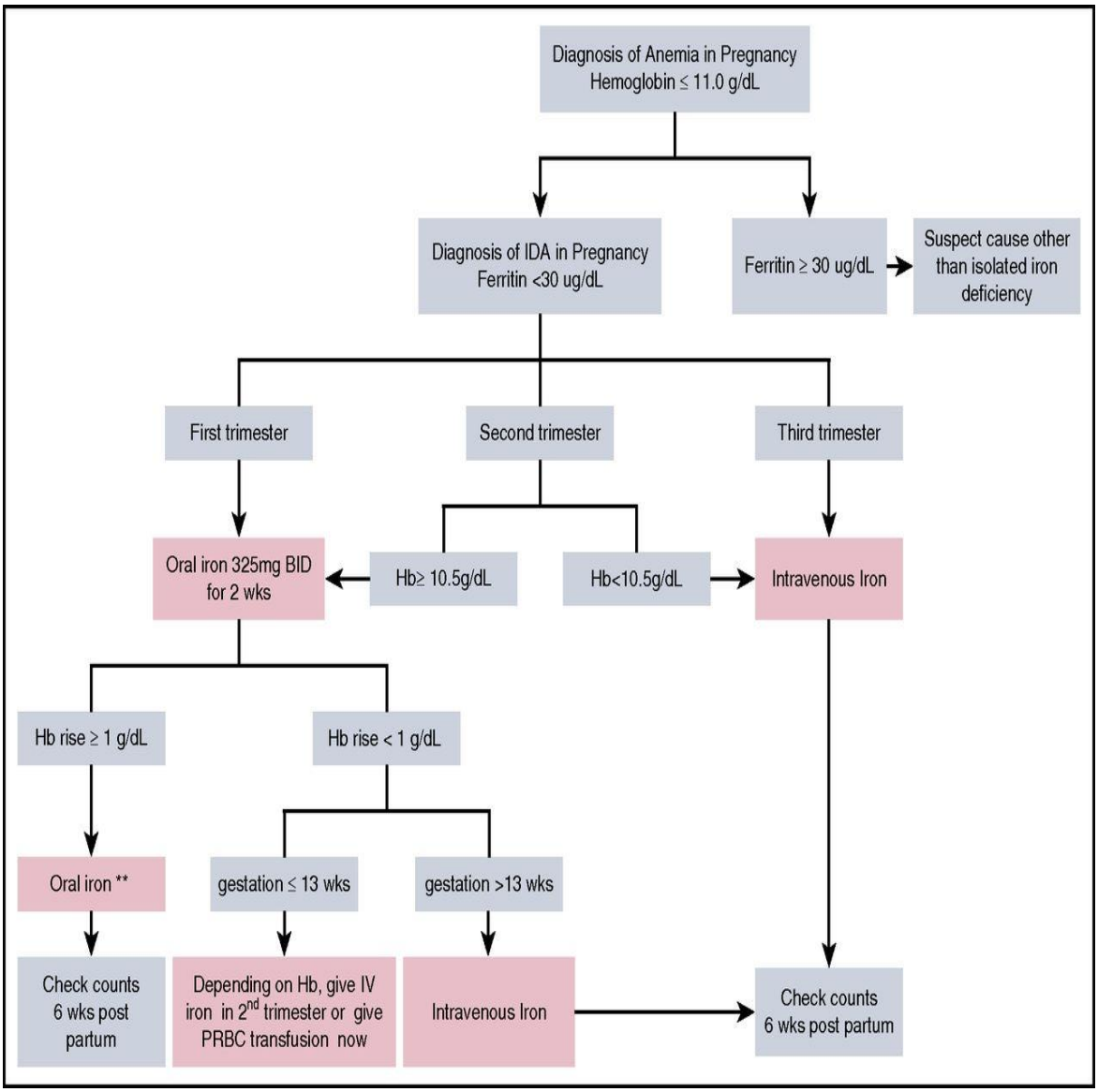
Vomiting in pregnancy

Figure 1. Algorithm for treatment of nausea and vomiting of pregnancy: *If no improvement, proceed to next step.*



IM—intramuscular, IV—intravenous, NVP—nausea and vomiting of pregnancy, PO—by mouth, PR—by rectum.

How I treat anemia in pregnancy?



Outcomes/consequences of anemia during pregnancy

Anemia is an important risk factor for both maternal and fetal morbidity. Iron-deficiency anemia is associated with higher rates of preterm birth, low birth weight (LBW), and small-for-gestational age

(SGA) newborns.Maternal iron deficiency affects iron concentrations in umbilical cord blood. Fetal-neonatal iron deficiency causes diminished auditory recognition memory in infants, a reflection of its impact on the developing hippocampus. Children born to iron-deficient mothers demonstrate learning and memory impairments that may persist into adulthood.Folic acid deficiency, especially at the time of conception, is strongly correlated with increased neural tube defects (NTDs). Low maternal RBC folate is also associated with LBW, and an increased risk for SGA.Maternal vitamin B12 (cobalamin) status affects fetal growth and development. Low cobalamin is associated with an increased fetal risk of low lean mass and excess adiposity, increased insulin resistance, and impaired neurodevelopment. Maternal risks include fatigue, pallor, tachycardia, poor exercise tolerance, and suboptimal work performance.Depleted blood reserves during delivery may increase the need for blood transfusion, preeclampsia, placental abruption,cardiac failure, and related death.In this article, we present 3 cases to address how we treat the most common nutritional causes of anemia of pregnancy: iron, cobalamin, and folate deficiencies.

Iron requirement in pregnancy:

In a typical pregnancy, maternal iron requirements include 300 to 350 mg for the fetus and the placenta, 500 mg for the expansion of the maternal RBC mass, and 250 mg associated with blood loss during labor and delivery. The requirement for iron increases gradually from 0.8 mg per day in the first trimester to 7.5 mg per day in the third.Yet, the average daily absorption of iron from western diets is only 1 to 5 mg.Therefore, women cannot fulfill their iron needs from normal food intake, and must draw upon iron stores, increasing the risk of iron-deficiency anemia. The CDC recommends that all pregnant women begin a 30 mg per day iron supplement at the first prenatal visit, the WHO suggests 60 mg per day for all pregnant women, whereas British

guidelines do not recommend any routine iron supplementation in pregnancy.

Hemoglobin level

Maternal Hb declines progressively during pregnancy due to hemodilution and may be accentuated by iron-deficient erythropoiesis, with a nadir reached at 24 to 32 weeks' gestation. Due to considerable variation in Hb level, it cannot be used as a single parameter to estimate iron status.

Ferritin

Ferritin reflects total body iron stores. Iron deficiency is the only clinical situation associated with extremely low values of ferritin. Ferritin declines gradually during pregnancy, reaches a nadir during weeks 35 to 38, and increases during the month before delivery. The nadir is about 15 ng/mL without iron supplementation and 20 ng/mL with it.Studies correlating the presence or absence of stainable marrow iron with serum ferritin indicate that the 12 ng/mL threshold of ferritin is only 25% sensitive for detecting iron deficiency. Instead, a ferritin of 30 ng/mL or less has a 92% sensitivity and 98% specificity for diagnosing iron deficiency. Ferritin is a more sensitive and specific marker for iron deficiency than serum iron, transferrin saturation, and erythrocyte protoporphyrin values and is the best test for iron deficiency in pregnancy if low.

In the absence of active comorbidity, ferritin values >100 ng/mL indicate adequate iron stores and a low likelihood of iron-deficiency anemia.

Mean corpuscular volume

MCV is an unreliable marker of iron deficiency in pregnancy. Stimulation of erythropoiesis leads to a physiologic increase in MCV during gestation that counterbalances the microcytosis of iron

deficiency.A low MCV, defined as an MCV <80 fL, is highly sensitive, but not specific, for iron-deficiency anemia.

Iron, transferrin, and transferrin saturation

Serum iron circulates bound to its transport protein, transferrin. The serum iron reflects both iron recycling from macrophages and iron absorbed from the diet. It demonstrates diurnal variation, with a rise in the morning and fall at night; serum iron is also influenced by recently ingested meals. Therefore, no single value is diagnostic of iron deficiency.Serum iron should be drawn after an overnight fast. Total iron-binding capacity (TIBC) and transferrin are measurements of iron transport proteins that increase in iron deficiency. Inflammation, chronic infection, malignancies, liver disease, nephrotic syndrome, and malnutrition can lower TIBC, whereas pregnancy can raise it, in the absence of iron deficiency.

Plasma transferrin saturation is the ratio of plasma iron to transferrin. A saturation of <15% suggests an inadequate supply of iron,either because of low total body iron (iron deficiency) or due to trapping of iron in macrophages (anemia of inflammation).

Soluble transferrin receptor

The soluble transferrin receptor (sTfR) is a truncated fragment of the membrane receptor. In iron deficiency, synthesis of transferrin receptors, and sTfR, is increased.Unlike TIBC and ferritin, sTfR concentrations are not affected by inflammation.A meta-analysis of 10 studies of sTfR showed that the assay had a sensitivity of 86% and a specificity of 75%. However, the assay is not standardized and is not used in routine diagnosis of iron-deficiency anemia.

Hepcidin

Hepcidin is the master regulator of systemic iron bioavailability. Hepcidin decreases as pregnancy progresses, with the lowest hepcidin

levels seen in the third trimester.33 Pregnant women with undetectable serum hepcidin transfer more maternally ingested iron to their fetus than women with detectable hepcidin, indicating that maternal hepcidin in part determines the iron bioavailability to the fetus.Hepcidin is currently being evaluated as a biomarker in pregnancy.

In summary, Hb, the percentage of transferrin saturation, and plasma ferritin are adequate to assess iron status in the majority of pregnant women, and the combination of anemia and ferritin <15 to 30 ng/mL is diagnostic of iron deficiency.

Folic acid and vitamin B12 (cobalamin) deficiency

Prior to nationwide mandatory folate fortification programs, folate deficiency was the second most common cause of anemia during pregnancy. The prevalence of folate deficiency in pregnancy varies from 1% to 50%, and is higher in economically deprived regions of the world. Numerous studies illustrate that the prevalence of both folic acid and cobalamin deficiency increase with advancing gestation.

Folate and cobalamin are involved in tetrahydrofolate metabolism, and are necessary for DNA synthesis for fetal growth and maternal tissue growth.Dietary folate is absorbed in the jejunum. Poor nutrition, intestinal malabsorption, and increased requirements for fetal growth may contribute to folate deficiency. Cobalamin is present in animal protein and absorbed in the terminal ileum. R-protein (haptocorrin), secreted by salivary glands, binds cobalamin in the stomach and transports cobalamin to the duodenum where pancreatic proteases degrade the R-protein. Cobalamin is then released and binds to intrinsic factor released from gastric parietal cells. The cobalamin-intrinsic factor complex subsequently binds to receptors on ileal enterocytes. Atrophic gastritis, proton pump inhibitors, and malabsorption all increase the risk of cobalamin deficiency.

Bariatric surgery in the United States increased by 800% between 1998 and 2005, with women accounting for 83% of procedures in the 18- to 45-year age group.75 In a retrospective study, anemia was detected in 17% of patients undergoing bariatric surgery, low ferritin in 15%, low cobalamin in 11%, and low RBC folate in 12%.

Management of folate deficiency

Because of the significant consequences of folate deficiency on neural tube development, folate supplementation is a standard component of antenatal care in the United States and Canada. National-scale public health initiatives requiring fortification of flour with folic acid in the United States and Canada have been effective in substantially reducing the prevalence of NTDs.85 By contrast, Khoshnood et al, in an observational study of 11 353 cases of NTD in 12.5 million births in 19 countries in Europe, showed no change in prevalence of NTDs between 1991 and 2011, despite longstanding recommendations promoting folic acid supplementation and the existence of voluntary folic acid fortification.Absent mandatory fortification, the prevalence of NTD in Europe has remained unchanged.

Folate fortification of foods in the United States is recommended because the neural tube closes around day 26 of gestation, a time when most women do not yet know they are pregnant. The C677T single nucleotide polymorphism (SNP) of MTHFR confers higher risk of NTD and such mothers have higher folate requirements. Yet, the SNP may confer greater protection against development of anemia and perhaps even maternal survival. This might explain the high allele frequency of this polymorphism in some populations through selective pressure.

The WHO recommends folate supplementation for pregnant women, 400 µg per day from early pregnancy to 3 months postpartum. The US Public Health Service and CDC recommend the same for all women of

childbearing age (15-45 years of age) to prevent spina bifida and anencephaly.

Most prenatal vitamins contain 1 mg of folate, which is more than sufficient to meet the increased needs of pregnancy. A higher supplementation dose, 5 mg per day, is recommended in women who have increased demands for folate (multiple pregnancies, hemolytic disorders, folate metabolism disorders) and in women who are at an increased risk of NTDs (personal or family history of NTD, pregestational diabetes, epilepsy on valproate or carbamazepine).

Cobalamin deficiency

Owing to the relatively large amounts of cobalamin that are stored in the human body, cobalamin deficiency in pregnancy is far less common than folate deficiency. However, with more pregnant women having undergone bariatric surgery, the risk of cobalamin deficiency is increased. Mead et al examined 113 women with a history of gastric bypass surgery delivering 150 babies and showed low cobalamin in over 10% of patients after biliopancreatic diversion, Roux-en-Y gastric bypass, or sleeve gastrectomy.

The WHO and US National Institutes of Health (NIH) recommend a higher daily allowance of cobalamin in pregnant women than in nonpregnant women (2.6 vs 2.4 µg per day) to support fetal neurologic development. Growth retardation, general hypotonia, and loss of neuromotor skills have been described in infants of mothers with cobalamin deficiency.Furthermore, cobalamin supplementation improves the motor functioning and regurgitation of cobalamin-deficient infants.Notably, hematologic abnormalities caused by cobalamin deficiency may respond to folate supplementation, leaving other consequences of cobalamin deficiency unchecked. Therefore, prompt recognition of cobalamin deficiency and rapid treatment are of great significance.

Patient 2 was at risk of cobalamin (and iron) deficiency as a result of her bariatric procedures. She received intramuscular cobalamin 1000 mcg every 4 weeks, through pregnancy and the puerperium, with recommendation for lifelong replacement therapy. Our practice is to treat all pregnant women with laboratory data suggestive of cobalamin deficiency, irrespective of the cause.

Treatment of cobalamin deficiency in pregnancy is similar to that outside of pregnancy and can be achieved through oral or parenteral replacement. When oral vitamin cobalamin 1000 mcg daily is used, serum levels should be monitored to ensure adequate repletion. For patients who have had bariatric surgery, or other conditions that might interfere with intestinal absorption, sublingual cobalamin is an alternative to oral,and in patients with neurological features attributable to cobalamin deficiency, parenteral treatment is preferred.

RBC transfusions in pregnancy

Patient 3 received blood. Alongside preventive measures, rapid access to safe blood products is critical to reducing anemia-related mortality in women in developing countries.The most common indications for blood in sub-Saharan Africa are maternal hemorrhage, trauma, and malaria-associated anemia.In a study of blood transfusion services in Malawi, the mean Hb of transfused patients was 4.8 g⁄dL, and 17% (18 of 104) were given to pregnant women.

Guidelines for the management of postpartum hemorrhage have been published by a number of obstetric societies. The most recent French guidelines recommend transfusion in the setting of postpartum hemorrhage in order to maintain a Hb concentration >8 g/dL.

The latest transfusion guidelines of the AABB (formerly the American Association of Blood Banks) are based on 12 587 patients enrolled in 31 eligible randomized controlled trials in nonobstetric settings. They recommend using a restrictive Hb transfusion threshold of 7 g/dL for

hemodynamically stable hospitalized adult patients. The evidence base that supports this approach in obstetrics is limited. Therefore, clinicians should consider the Hb, overall clinical context, patient preferences, and alternative therapies when making transfusion decisions for a patient.

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1.World Health Organization. Iron Deficiency Anaemia: Assessment, Prevention and Control: A Guide for Programme Managers. Geneva, Switzerland: World Health Organization; 2001.
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3.WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, Switzerland: World Health Organization; 2011.
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Dysmenorrhea

How can I know if the dysmenorrhea (pain of menstrual cramps) I'm having is normal?

If you have severe or unusual menstrual cramps or cramps that last for more than 2 or 3 days, contact your healthcare provider. Both primary and secondary menstrual cramps can be treated, so it's important to get checked.

First, you will be asked to describe your symptoms and menstrual cycles. Your healthcare provider will also perform a pelvic exam. During this exam, your doctor inserts a speculum (an instrument that lets the clinician see inside the vagina) and examines your vagina, cervix, and

uterus. The doctor will feel for any lumps or changes, and a small sample of vaginal fluid may be taken for testing.
If secondary dysmenorrhea is suspected, further tests may be needed.
If a medical problem is found, your healthcare provider will discuss treatments.
If you use tampons and develop the following symptoms, get medical help right away:
Fever over 102 degrees Fahrenheit
Vomiting
Diarrhea
Dizziness, fainting, or near fainting
A rash that looks like a sunburn
These are symptoms of toxic shock syndrome, a life-threatening illness.

How can I relieve mild dysmenorrhea (pain with mild menstrual cramps)?

To relieve mild menstrual cramps:

For best relief, you should take ibuprofen as soon as bleeding or cramping starts. You may take aspirin or another pain reliever such as acetaminophen.
Place a heating pad or hot water bottle on your lower back or abdomen.
Rest when needed.
Avoid foods that contain caffeine.
Avoid smoking and drinking alcohol.
Massage your lower back and abdomen.
Women who exercise regularly often have less menstrual pain. To help prevent cramps, make exercise a part of your weekly routine.
If these steps do not relieve pain, your health care provider can order medications for you, including ibuprofen or another anti-inflammatory medication (higher dose than is available over-the-counter). Also, oral contraceptives may be prescribed because women who take oral contraceptives have less menstrual pain.

Pregnant lady with HTN
Treatment:

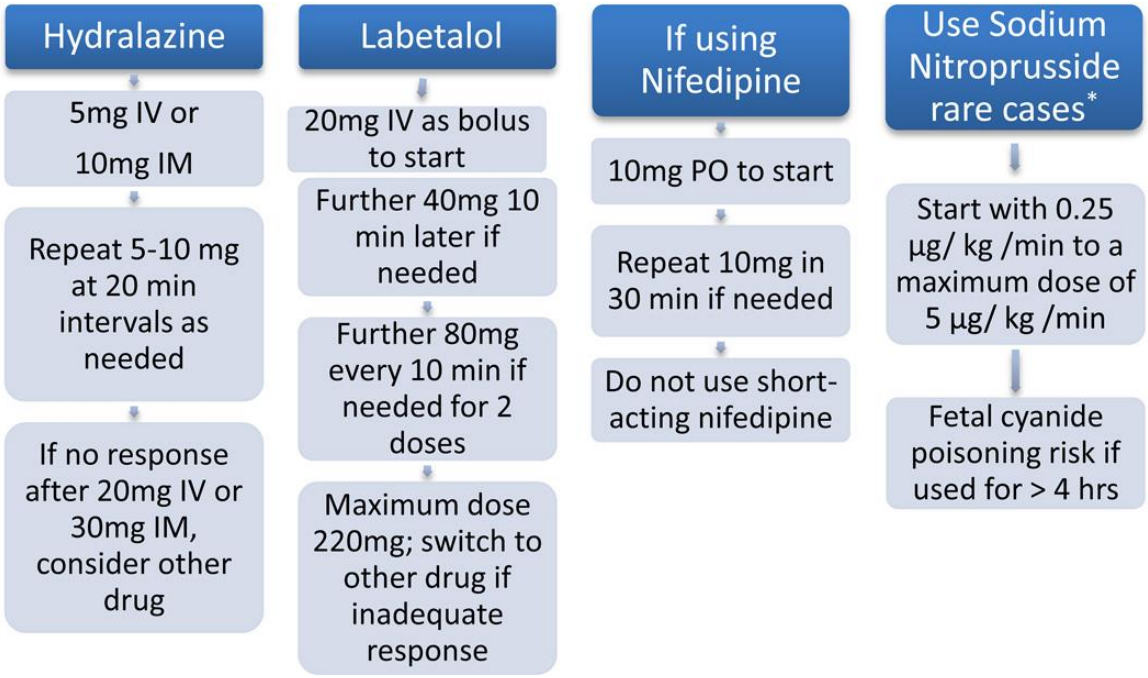


Table 1. Common Pharmacologic Therapies for Chronic Hypertension in Pregnancy.*

Drug	Class or Mechanism of Action	Usual Range of Dose	Comments
Methyldopa	Centrally acting alpha agonist	250 mg to 1.5 g orally twice daily	Often used as first-line therapy Long-term data suggest safety in offspring
Labetalol	Combined alpha- and beta-blocker	100–1200 mg orally twice daily	Often used as first-line therapy May exacerbate asthma Intravenous formulation is available to treat hypertensive emergencies
Metoprolol	Beta-blocker	25–200 mg orally twice daily	May exacerbate asthma Possible association with fetal growth restriction Other beta-blockers (e.g., pindolol and propranolol) have been safely used Some experts recommend avoiding atenolol
Nifedipine (long-acting)	Calcium-channel blocker	30–120 mg orally once daily	Use of short-acting nifedipine is typically not recommended, given risk of hypotension Other calcium-channel blockers have been safely used
Hydralazine	Peripheral vasodilator	50–300 mg orally in two or four divided doses	Intravenous formulation is available to treat hypertensive emergencies
Hydrochlorothiazide	Diuretic	12.5–50 mg orally once daily	Previous concerns about increased risk of an adverse outcome are not supported by recent data

* The use of angiotensin-converting–enzyme inhibitors or angiotensin-receptor blockers is contraindicated in pregnancy because of the risk of birth defects and fetal or neonatal renal failure.

REFERENCES

1. Sibai BM. Treatment of hypertension in pregnancy. N Engl J Med 1996;335:257–65.

Excellent review article of the management of hypertension in pregnancy.

Dermatology

Diagnostic guidelines for skin Problem

I. What Is Appropriate for the Evaluation and Treatment of Impetigo and Ecthyma?

Gram stain and culture of the pus or exudates from skin lesions of impetigo and ecthyma are recommended to help identify whether Staphylococcus aureus and/or a β-hemolytic Streptococcus is the cause (strong, moderate), but treatment without these studies is reasonable in typical cases (strong, moderate).

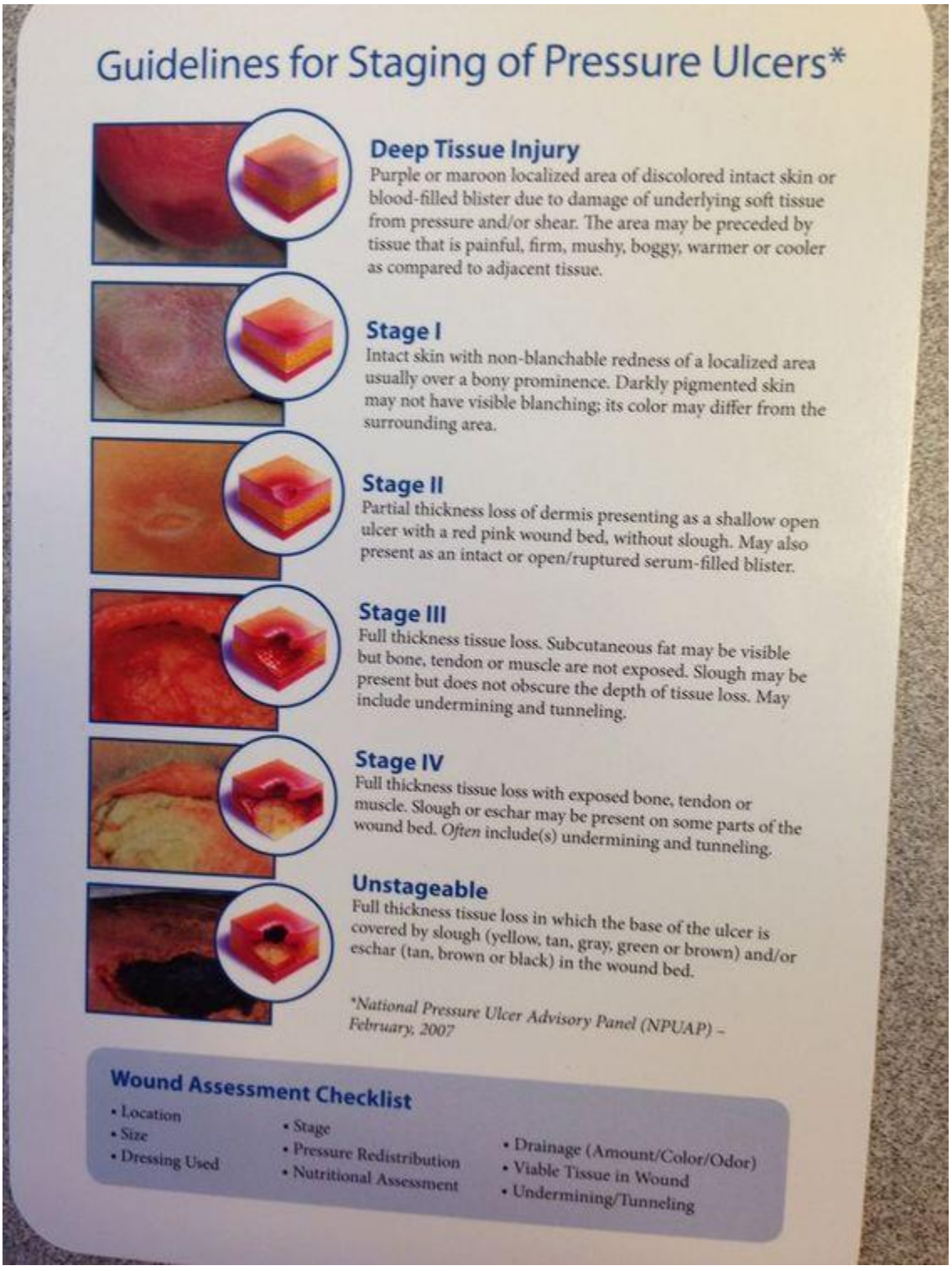
Bullous and nonbullous impetigo can be treated with oral or topical antimicrobials, but oral therapy is recommended for patients with numerous lesions or in outbreaks affecting several people to help decrease transmission of infection. Treatment for ecthyma should be an oral antimicrobial.

Treatment of bullous and nonbullous impetigo should be with either mupirocin or retapamulin twice daily (bid) for 5 days (strong, high).

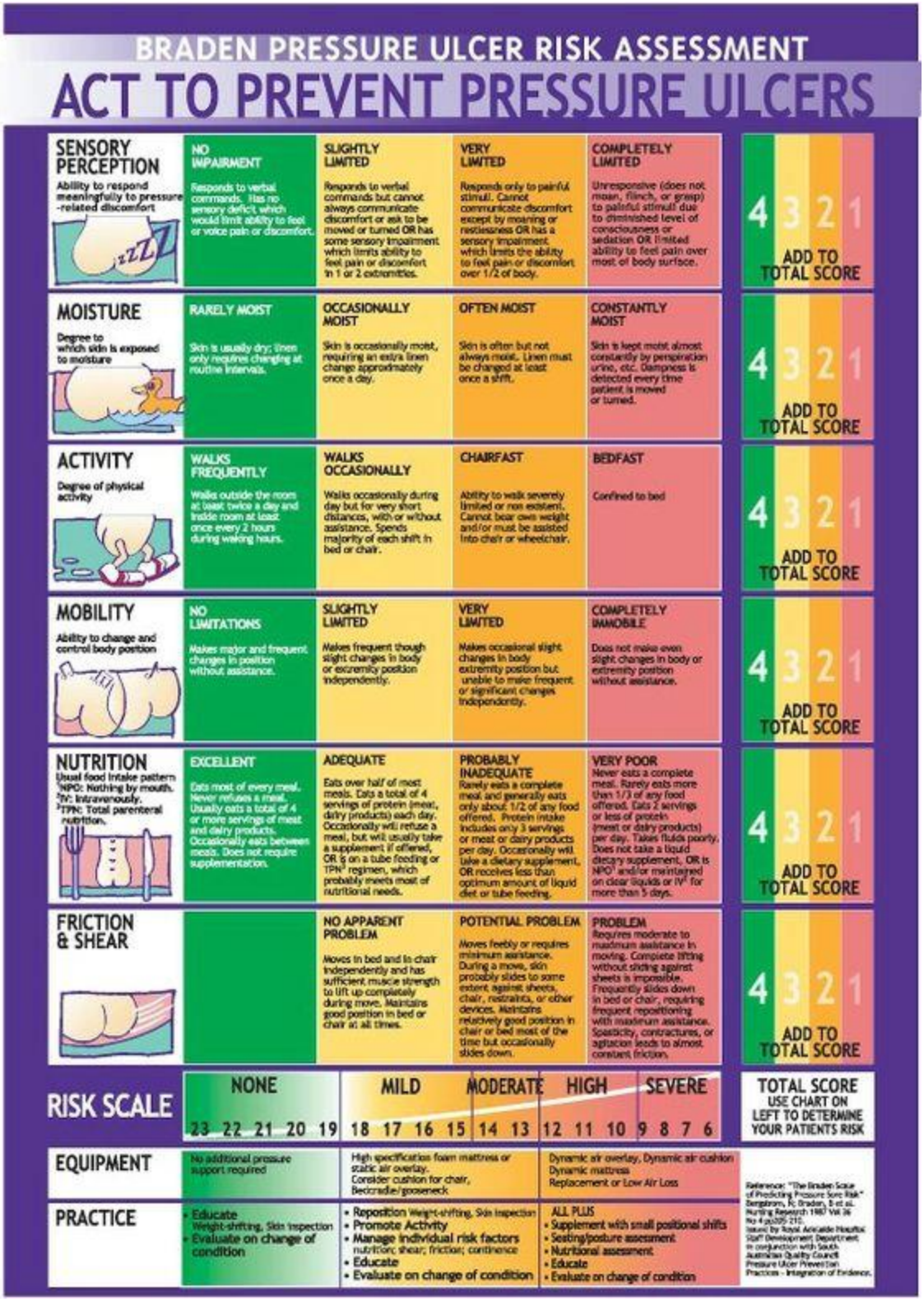
Oral therapy for ecthyma or impetigo should be a 7-day regimen with an agent active against S. aureus unless cultures yield streptococci alone (when oral penicillin is the recommended agent) (strong, high). Because S. aureus isolates from impetigo and ecthyma are usually methicillin susceptible, dicloxacillin or cephalexin is recommended. When MRSA is suspected or confirmed, doxycycline, clindamycin, or sulfamethoxazole-trimethoprim (SMX-TMP) is recommended (strong, moderate).

Systemic antimicrobials should be used for infections during outbreaks of poststreptococcal glomerulonephritis to help eliminate nephritogenic strains of S. pyogenes from the community (strong, moderate).

GUIDELINE FOR STAGING OF PRESSURE ULCERS:



ACT TO PREVENT PRESSURE ULCER:


BRADEN PRESSURE ULCER RISK ASSESSMENT
ACT TO PREVENT PRESSURE ULCERS
SENSORY PERCEPTION
Ability to respond meaningfully to pressure -related discomfort
NO IMPAIRMENT
Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.
SLIGHTLY LIMITED
Responds to verbal commands but cannot always communicate discomfort or ask to be moved or turned OR has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.
VERY LIMITED
Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness OR has a sensory impairment which limits the ability to feel pain or discomfort over 1/2 of body.
COMPLETELY LIMITED
Unresponsive (does not moan, flinch, or grasp) to painful stimuli due to diminished level of consciousness or sedation OR limited ability to feel pain over most of body surface.
4 3 2 1
ADD TO TOTAL SCORE
MOISTURE
Degree to which skin is exposed to moisture
RARELY MOIST
Skin is usually dry; linen only requires changing at routine intervals.
OCCASIONALLY MOIST
Skin is occasionally moist, requiring an extra linen change approximately once a day.
OFTEN MOIST
Skin is often but not always moist. Linen must be changed at least once a shift.
CONSTANTLY MOIST
Skin is kept moist almost constantly by perspiration urine, etc. Dampness is detected every time patient is moved or turned.
4 3 2 1
ADD TO TOTAL SCORE
ACTIVITY
Degree of physical activity
WALKS FREQUENTLY
Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.
WALKS OCCASIONALLY
Walks occasionally during day but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.
CHAIRFAST
Ability to walk severely limited or non existent. Cannot bear own weight and/or must be assisted into chair or wheelchair.
BEDFAST
Confined to bed
4 3 2 1
ADD TO TOTAL SCORE
MOBILITY
Ability to change and control body position
NO LIMITATIONS
Makes major and frequent changes in position without assistance.
SLIGHTLY LIMITED
Makes frequent though slight changes in body or extremity position independently.
VERY LIMITED
Makes occasional slight changes in body extremity position but unable to make frequent or significant changes independently.
COMPLETELY IMMOBILE
Does not make even slight changes in body or extremity position without assistance.
4 3 2 1
ADD TO TOTAL SCORE
NUTRITION
Usual food intake pattern
*NPO: Nothing by mouth.
*IV: Intravenously.
*TPN: Total parenteral nutrition.
EXCELLENT
Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.
ADEQUATE
Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered, OR is on a tube feeding or TPN* regimen, which probably meets most of nutritional needs.
PROBABLY INADEQUATE
Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings or meat or dairy products per day. Occasionally will take a dietary supplement, OR receives less than optimum amount of liquid diet or tube feeding.
VERY POOR
Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, OR is NPO* and/or maintained on clear liquids or IV* for more than 5 days.
4 3 2 1
ADD TO TOTAL SCORE
FRICTION & SHEAR
NO APPARENT PROBLEM
Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.
POTENTIAL PROBLEM
Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.
PROBLEM
Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.
4 3 2 1
ADD TO TOTAL SCORE
RISK SCALE
NONE
MILD
MODERATE
HIGH
SEVERE
23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6
TOTAL SCORE
USE CHART ON LEFT TO DETERMINE YOUR PATIENTS RISK
EQUIPMENT
No additional pressure support required
High specification foam mattress or static air overlay. Consider cushion for chair, Beds cradle/gooseneck
Dynamic air overlay, Dynamic air cushion Dynamic mattress Replacement or Low Air Loss
PRACTICE
• Educate Weight-shifting, Skin inspection
• Evaluate on change of condition
• Reposition Weight-shifting, Skin inspection
• Promote Activity
• Manage individual risk factors nutrition; shear; friction; continence
• Educate
• Evaluate on change of condition
ALL PLUS
• Supplement with small positional shifts
• Seating/posture assessment
• Nutritional assessment
• Educate
• Evaluate on change of condition

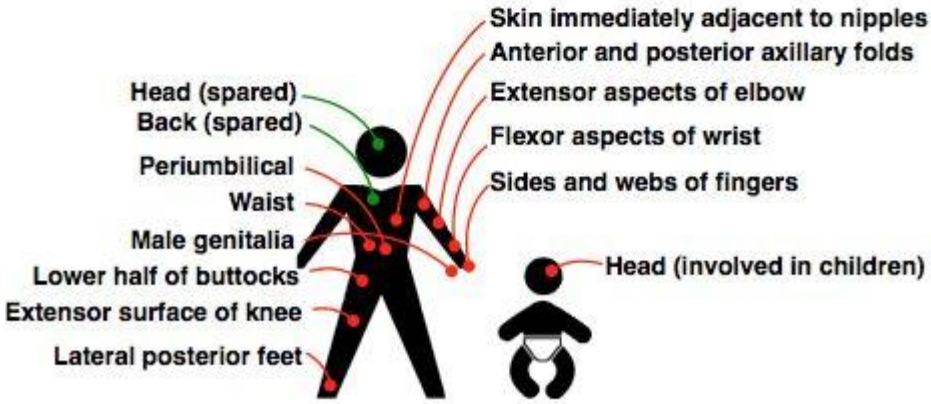
SCABIES :

Scabies

1. Mite lays eggs and drops feces

2. Type 4 hypersensitivity reaction
   Intense pruritus
   Worse at night

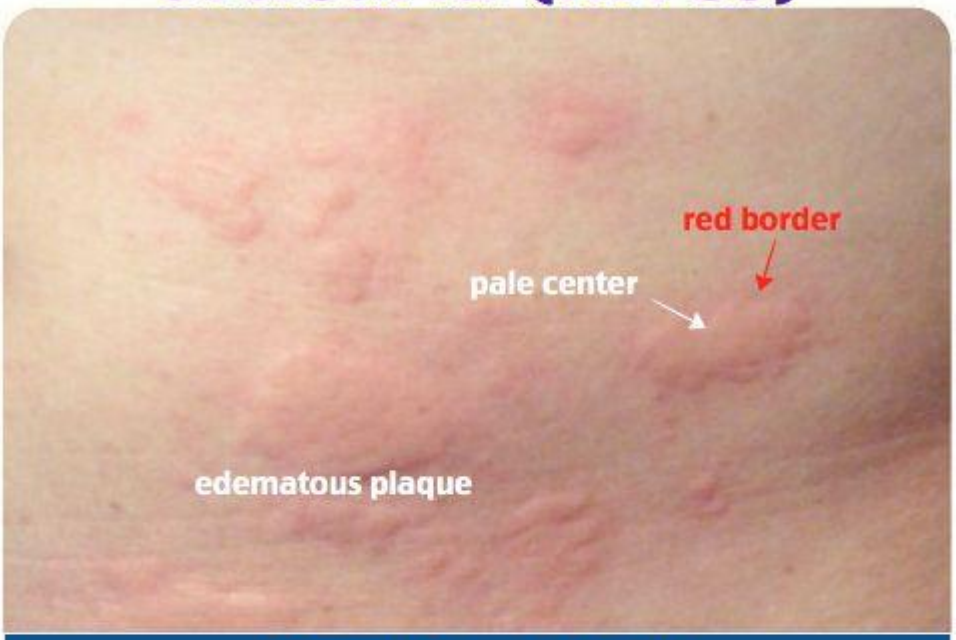
Clinical - Rash
- Small, erythematous, nondescript papule
- Often excoriated, hemorrhagic crusts



Management
Eradication of mites
- Permethrin 5% cream (safe for infants)
- Oral Ivermectin (ideal for nursing home outbreaks)

URTICRIA

Urticaria (hives)



Common Causes of Urticaria		
Drugs	Penicillin Sulfa Aspirin Local anesthetics Diuretics	NSAIDs Morphine Codeine Progesterone
Infection	Epstein-Barr virus Hepatitis B virus	Coxsackie virus Parasitic infections
Environmental	Heat Cold Exercise	Metals Animal saliva
Food	Fish Eggs Nuts	Shellfish Fruits
Other	Latex Pregnancy Malignancy	

ATOPIC DERMATITIS (ECZEMA):

Signs and Symptoms

The signs and symptoms of eczema (atopic dermatitis) differ widely from one person to another and may include any of the following:

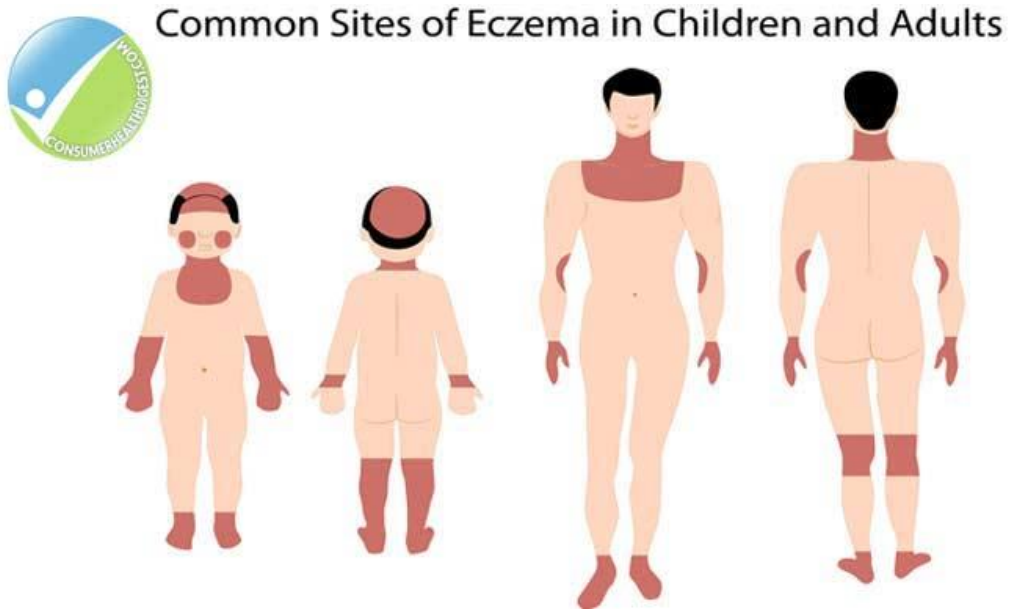
Itching which usually worsens at night or during extreme temperatures

Red to dark brownish spots especially on the hands, wrists, feet, ankles, neck, upper chest, inside the bend of the knees and elbows and in infants the scalp and facial area.

Small to medium raised bumps with may release fluid and crust over when scratched.

Dry, thickened, cracked, scaly skin.

Raw, swollen, sensitive skin when scratched



Common Eczema Triggers[7]

Irritants
- Soaps, detergents
- Disinfectants (chlorine)
- Contact with:
  - Juices from fresh fruits, meats, vegetables
  - Chemicals, fumes on the job

Allergens
- House dust mites
- Pets (cats > dogs)
- Pollens (seasonal)
- Molds
- Dandruff

Microbes
- Certain bacteria ***(Staphylococcusaureus)***
- Viruses
- Certain fungi

Others
- Hot or cold temperatures
  - Heat
  - Humidity
  - Perspiration from exercising
- Foods
- Stress
- Hormones

Atopic dermatitis usually begins before a child reaches his/her 5th birthday and may persist into adolescence and adulthood. For many affected individuals, it flares periodically then clears up

for a certain time period.

There are factors that can worsen atopic dermatitis (eczema) which are:

Dry skin from hot, long showers or baths.

Scratching

Bacteria and viruses

Sweat

Stress

Heat and humidity changes

Chemicals like solvents, soaps, cleaners, etc.

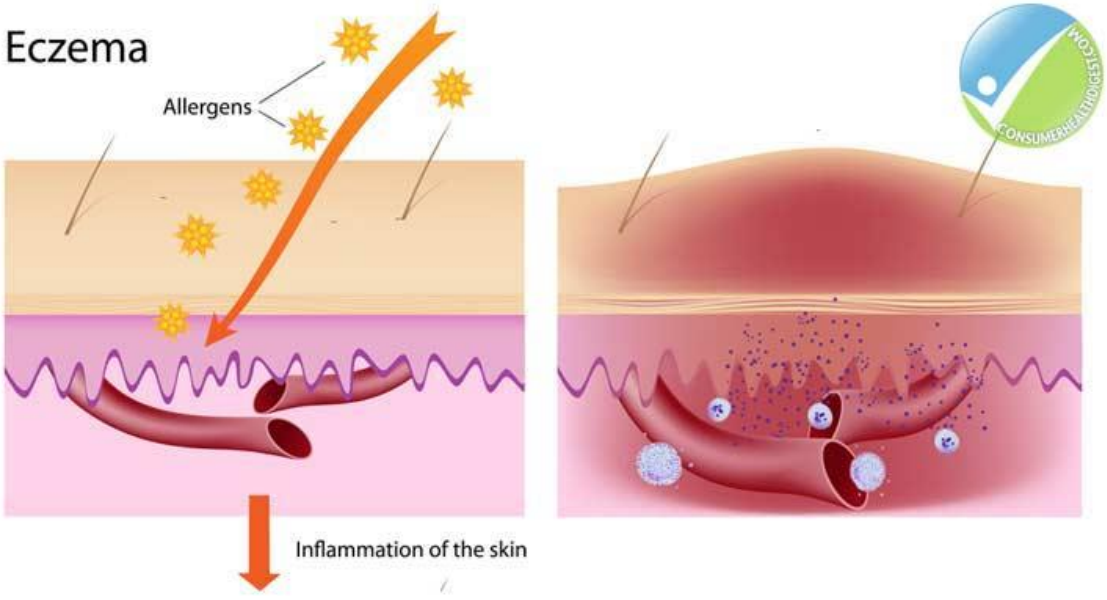
Wool in beddings and clothing

Dust and pollen

Air pollution including tobacco smoke

Allergens like eggs, milk, soybean, wheat, etc.

Causes and Risk Factors



The exact cause of eczema is still a mystery. The most common type, atopic dermatitis is similar to an allergy. However, the skin irritation which occurs is not an allergic reaction. Experts believe that eczema is caused by a combination of the following factors:

Genetics

Abnormal immune system function

Environment

Activities that can irritate the skin

Defects in the barrier of the skin

A proven fact about eczema is that it is not contagious so you can't get it through contact with someone who has it. Eczema runs in families, so there is a genetic role in its development. A major risk factor is having relatives who have or had eczema, asthma or seasonal allergies.

Types of Eczema

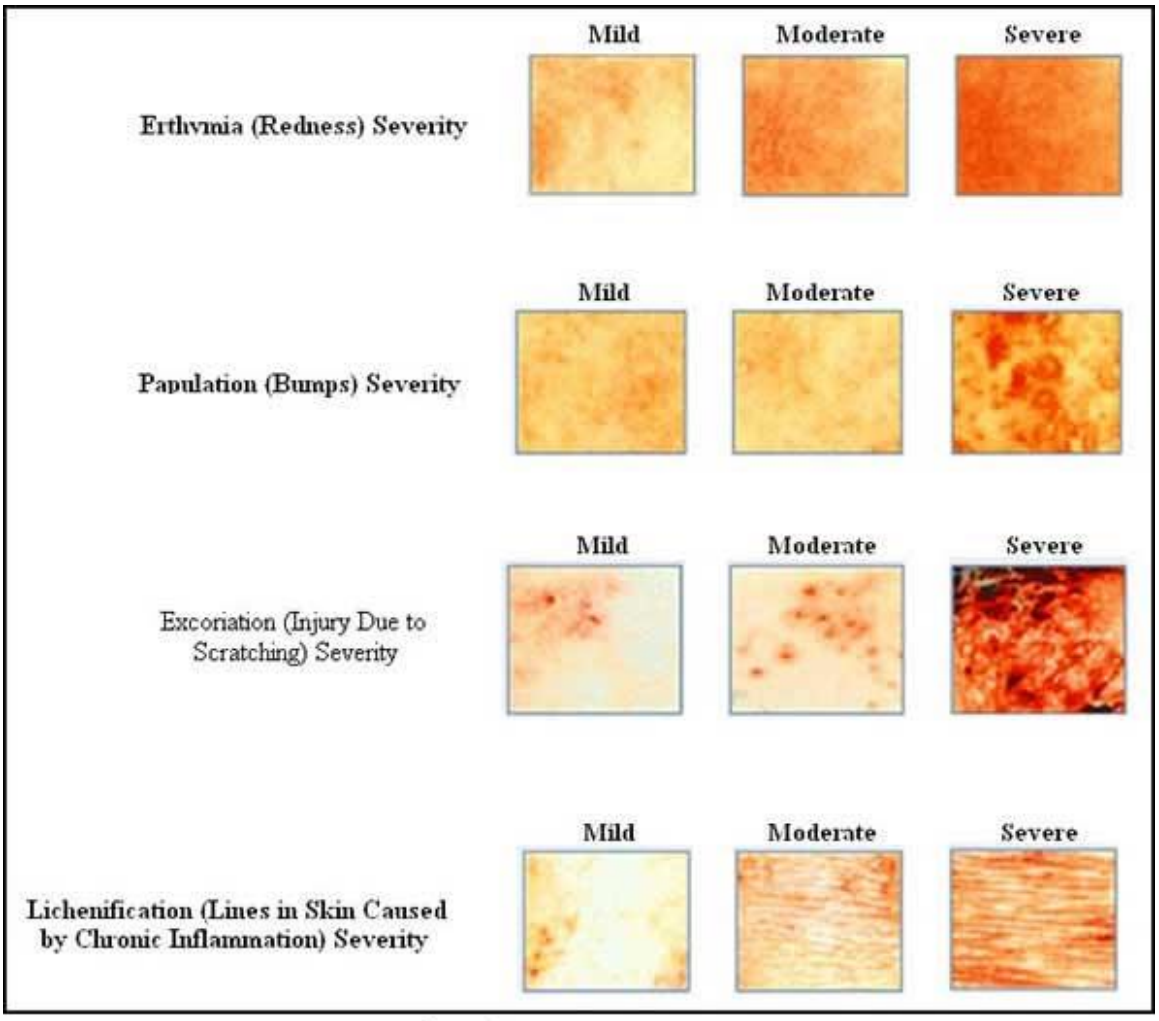


Image via easeeczema.org

Atopic Dermatitis – This is the most common form of eczema which often affects people with asthma, hay fever, family history of eczema, asthma or hay fever. It usually begins during infancy or childhood but can strike anyone regardless of age. It usually affects the skin on the

face, hands, feet, inner elbows and back of the knees.

Contact Dermatitis – There are two types of contact dermatitis which are irritant contact dermatitis and allergic contact dermatitis. These types of eczema develop after a substance damages the skin. Some examples are chemicals and strong soap used for frequent hand washing.

Dyshidrotic Dermatitis – This is a particular type of eczema that affects the hands and feet. The cause is still unknown, and the symptoms are severe itching, blistering and deep cracks on the skin. It may become chronic and painful, but there are several treatment options available.

Nummular Dermatitis – This is a type of eczema that often affects males. It usually starts after a man's mid-50s, but women can get it during their teen years or early adulthood. It causes coin-shaped red marks on the legs, back of the hands, forearms, lower back, and hips. Its cause is still unknown but cold and dry air, chemicals and metals can trigger an episode.

Neurodermatitis – This type of eczema develops in spots that are frequently scratched because of habit. It often affects the back, sides/back of the neck, genitals and scalp.

Seborrheic Dermatitis – This is more commonly known as dandruff. It causes skin to fall off in flakes. In some cases, it can be due to an overgrowth of a specific type of yeast. It is harder to treat* in people with weakened immune systems.

Statis Dermatitis – This type of eczema develops in people when the veins in the lower part of the legs are not able to return blood properly to the heart. It can arise quickly which causes crusting and weeping of the skin. Over time, it can lead to brown stains on the skin.

Treatment

Treatments for atopic eczema can help to ease the symptoms. There's no cure, but many children find their symptoms naturally improve as they get older.

The main treatments for atopic eczema are:

emollients (moisturisers) – used every day to stop the skin becoming dry

topical corticosteroids – creams and ointments used to reduce swelling and redness during flare-ups

Other treatments include:

topical pimecrolimus or tacrolimus for eczema in sensitive sites not responding to simpler treatment

antihistamines for severe itching

bandages or special body suits to allow the body to heal underneath

more powerful treatments offered by a dermatologist (skin specialist)

Prevention

The following tips may help prevent bouts of dermatitis (flares) and minimize the drying effects of bathing:

Moisturize your skin at least twice a day. Creams, ointments and lotions seal in moisture. Choose a product or products that work well for you. Using petroleum jelly on your baby's skin may help prevent development of atopic dermatitis.

Try to identify and avoid triggers that worsen the condition. Things that can worsen the skin reaction include sweat, stress, obesity, soaps, detergents, dust and pollen. Reduce your exposure to your triggers.

Infants and children may experience flares from eating certain foods, including eggs, milk, soy and wheat. Talk with your child's doctor about identifying potential food allergies.

Take shorter baths or showers. Limit your baths and showers to 10 to 15 minutes. And use warm, rather than hot, water.

Take a bleach bath. The American Academy of Dermatology recommends considering a bleach bath to help prevent flares. A diluted-bleach bath decreases bacteria on the skin and related infections. Add 1/2 cup (118 milliliters) of household bleach, not concentrated bleach, to a 40-gallon (151-liter) bathtub filled with warm water. Measures are for a U.S.-standard-sized tub filled to the overflow drainage holes.

Soak from the neck down or just the affected areas of skin for about 10 minutes. Do not submerge the head. Take a bleach bath no more than twice a week.

Use only gentle soaps. Choose mild soaps. Deodorant soaps and antibacterial soaps can remove more natural oils and dry your skin.

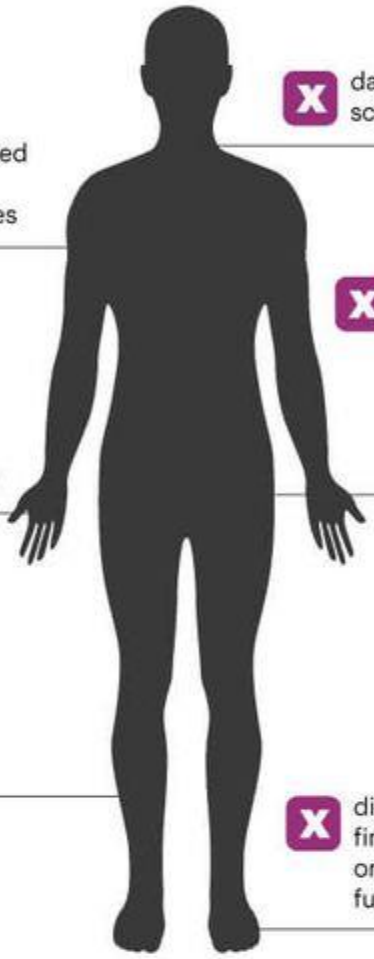
Dry yourself carefully. After bathing gently pat your skin dry with a soft towel and apply moisturizer while your skin is still damp.

PSORIASIS

PSORIASIS

SYMPTOMS & CAUSES

Symptoms



- dandruff on the scalp
- cracked, discolored skin that easily bleeds and bruises
- plaques of red skin, sometimes also covered with a crust of scales that tend to be silver or white
- nails that detach from the nail beds and can be painful or bloody
- loose skin or lesions that can be sensitive, itchy and painful
- discoloration in the finger and toenails or growth of toenail fungus

Causes

Poor diet

Abnormal small intestine permeability

An increased number of T cells in the blood,

Treatment :

TABLE 2: PSORIASIS TREATMENTS

Treatment	Comments
Topical agents	Topical agents are applied directly to the skin in the form of creams or ointments. These agents reduce inflammation, slow down the immune system, help skin peel, and unclog pores.
Systemic treatments	Systemic treatments suppress the immune system and are used for moderate to severe psoriasis.
Biologics	Biologics are used for moderate to severe psoriasis. Biologics target specific parts of the immune system instead of affecting the entire immune system as systemic treatments do.
Light therapy	Natural or artificial ultraviolet light can be used to slow down the growth of skin cells. Light therapy is often combined with medication.
Combination therapy	More than 1 agent is prescribed. Combination therapy leads to better results.
Psychological support	People with psoriasis often become depressed, self-conscious, and fearful of social rejection. Psychological counseling can help patients cope.

Adapted from references 10-12.

Table 2. Summary of treatment options available for psoriasis[4,5]

Formulation	Therapeutic class	Sample agents[a]
Topical	Calcineurin inhibitors	Pimecrolimus, tacrolimus
	Corticosteroids	Betamethasone, clobetasol, desonide
	Keratolytics	Salicylic acid
	Retinoids	Tazarotene
	Vitamin D analogues	Calcipotriene, calcitriol
Oral	Calcineurin inhibitors	Cyclosporine, tacrolimus
	Immunosuppressants	Leflunomide, methotrexate
	Miscellaneous	Acitretin, sulfasalazine
	Phosphodiesterase type 4 (PDE4) inhibitor	Apremilast
Biologic	Anti–tumor necrosis factor (TNF) inhibitors	Adalimumab, etanercept, infliximab
	Non anti-TNF inhibitors	Secukinumab, ustekinumab

[a]This table is not an all-inclusive list.

Ring worm

Table 1. Topical Treatments for Fungal Infections of the Hands and Feet

Antifungal Agent	Formulation	Dosage and Duration[a]	Availability	Comments
Terbinafine (Lamisil AT)	1% cream, gel, solution	*Tinea pedis/manuum:* qd or bid for 1-4 wk	OTC	May cause burning or local irritation
Butenafine (Lotrimin Ultra)	1% cream	*Tinea pedis/manuum:* qd or bid for 1-4 wk	OTC	May cause burning or local irritation
Clotrimazole (Lotrimin AF)	1% cream, solution	*Tinea pedis/manuum:* bid for up to 4 wk	OTC	Highly cost-effective
Miconazole	2% cream, ointment, powder, spray, gel	*Tinea pedis/manuum:* bid for 4 wk	OTC	Highly cost-effective
Tolnaftate (Tinactin)	1% cream, powder, solution, spray	*Tinea pedis/manuum:* bid for 2-4 wk. Solution: 1-3 drops	OTC	Recommended for prevention
Sertaconazole (Ertaczo)	2% cream	*Tinea pedis/manuum:* bid for 4 wk	Rx	Also has anti-inflammatory, antipruritic, and antibacterial effects
Econazole	1% cream	*Tinea pedis/manuum:* qd for 4 wk	Rx	May cause burning or local irritation
Ketoconazole	2% cream	*Tinea pedis/manuum:* qd for 6 wk	Rx	May cause burning or local irritation
Naftifine (Naftin)	1% cream, gel; 2% cream	*Tinea pedis/manuum:* cream qd or gel bid for 2-4 wk	Rx	Also has intrinsic anti-inflammatory properties
Ciclopirox (Loprox, Ciclodan, Penlac)	0.77% gel, cream, suspension 8% lacquer	*Tinea pedis/manuum:* bid for 4 wk *Tinea unguium:* qd for 48 wk	Rx OTC	May cause burning or local irritation Less risk of ADRs, but less effective for clinical cure; long therapy duration

[a] *Recommended for patients with normal renal function.*
ADR: adverse drug reaction.
Source: References 3, 4, 8, 26-28.

Classification of antifungal therapy based on their structure

Antifungal class	Examples
Antibiotics	
Polyenes	Amphotericin B, nystatin, natamycin
Heterocyclic benzofuran	Griseofulvin
Antimetabolite	Flucytosine
Azoles	
Imidazoles	Topical - clotrimazole, econazole, miconazole, bifonazole, fenticonazole, oxiconazole, tioconazole, sertaconazole, berconazole, luliconazole, eberconazole
	Systemic - ketoconazole
Triazoles	Itraconazole, fluconazole (also topical), voriconazole, posaconazole, isavuconazole, posoconazole, ravuconazole, pramiconazole, albaconazol
Allylamines	Terbinafine, butenafine, naftifine
Echinocandins	Caspofungin, anidulafungin, micafungin, aminocandin
Sordarin derivatives	GR135402, GM237354
Cell wall antagonist	Capsofungin, micafungin
Other agents	Tolnaftate, ciclopirox, amorolfine, undecylenic acid, buclosamide, Whitfield's ointment, benzoyl peroxide, zinc pyrithione, selenium sulfide, azelaic acid etc., nikkomycins, icofungipen
Newer and potential therapies	Demcidin, macrocarpal C

Summary of the use of topical antifungals used in the treatment of tinea corporis, cruris and pedis

Azole	Preparations	Site	Frequency of application	Duration of use
Imidazoles (%)				
Clotrimazole (1)	Cream, lotion	T. corporis/cruris/pedis	BD	4-6 weeks
Econazole (1)	Cream	T. corporis/cruris/pedis	OD-BD	4-6 weeks
Miconazole (1)	Cream, lotion	T. corporis/cruris/pedis	BD	4-6 weeks
Oxiconazole (2)	Cream, lotion	T. corporis/cruris/pedis	OD-BD	4 weeks
Sertaconazole (2)	Cream	T. corporis/cruris/pedis	BD	4 weeks
Luliconazole (1)	Cream, lotion	T. corporis/cruris/pedis	OD	2 weeks
Eberconazole (1)	Cream	T. corporis/cruris/pedis	OD	2-4 weeks
Triazoles (%)				
Efinaconazole (10)	Solution	T. pedis	OD	Up to 52 weeks in co-existing tinea unguium
Allylamines				
Terbinafine	Cream, powder	T. corporis	BD	2 weeks
		T. cruris	BD	2 weeks
		T. pedis	BD	4 weeks
		T. manum	BD	4 weeks
Naftifine 1%	Cream	T. corporis/cruris/pedis	OD-BD	Use 2 weeks beyond resolution of symptoms
Butenafine 1%	Cream	T. corporis/cruris/pedis	OD-BD	2-4 weeks
Others				
Amolorfine 0.25%	Cream	T. corporis	BD	4 weeks
Amphotericin B (1 mg) 0.1%	Lipid based gel	T. corporis	BD	2 weeks

T. corporis: Tinea corporis, T. pedis: Tinea pedis, T. manum: Tinea manum, T. cruris: Tinea cruris

Recommended dosing of different systemic antifungals in dermatophytosis

Condition	Drug	Dose (oral)	Duration
T. corporis/curis	Terbinafine	250 mg once daily, 3-6 mg/kg/day	2-3 weeks
	Itraconazole	200 mg/day	1-2 weeks
	Fluconazole	150-300 mg/week	3-4 weeks
	Gresiofulvin (micro size) (ultra-micro size)	500 mg/day (10-20 mg/kg/day)	2-4 weeks
		300-375 mg/day (5-10 mg/kg/day)	
T. pedis	Terbinafine	250 mg once daily	1 week (interdigital type), 2 weeks (moccasin)
	Itraconazole	100-200 mg/day	2-4 weeks
	Fluconazole	150 mg/weeks	4 weeks
	Gresiofulvin	750-1000 mg/day (micro size)	4-8 weeks
		660-750 mg/day (ultra-micro size)	

T. corporis: Tinea corporis, T. pedis: Tinea pedis

Seborrheic dermatitis

Seborrheic Dermatitis

WHAT IS IT?

- Sometimes referred to as 'Seb-Derm', it is an inflammatory skin condition associated with oily parts of the body.
- It is a long-term condition and considered a chronic form of eczema.
- It is not contagious and is not a sign of poor personal hygiene.
- It does not affect your overall health, but can be uncomfortable and cause embarrassment.
- Flare-ups are common and possible to manage with over-the-counter (OTC) skin care products.
- In infants, it is also referred to as 'cradle cap'.

SYMPTOMS

- Red inflamed skin
- Skin flakes
- White or yellow patches that appear greasy
- Skin feels itchy and/or burns

TRIGGERS

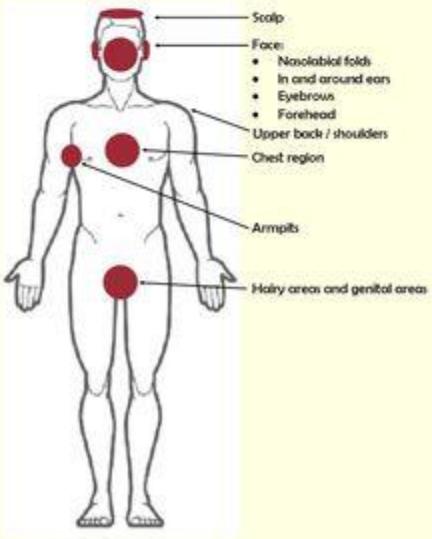
- Hormonal changes
- Illness – weakened immune system
- Seasonal Changes – dry, cold weather.
- Symptoms tend to be worse in early spring and winter

WHEN THESE SYMPTOMS ARE CONFINED TO THE SCALP, IT IS OFTEN REFERRED TO AS DANDRUFF.

TREATMENTS

- Avoid scratching and/or picking at affected areas.
- Wash skin regularly with mild and gentle soaps.
- Moisturize skin regularly. Dry skin promotes itching and flare-ups.
- Wear smooth textured cotton clothing.
- Medicated cleansing bars and shampoos that contain pyrithione zinc 2% (maximum OTC strength) have anti-fungal properties that can help control and reduce symptoms.
- Creams, lotions, and ointments that contain Hydrocortisone 1% (maximum OTC strength) help relieve itching and inflammation.

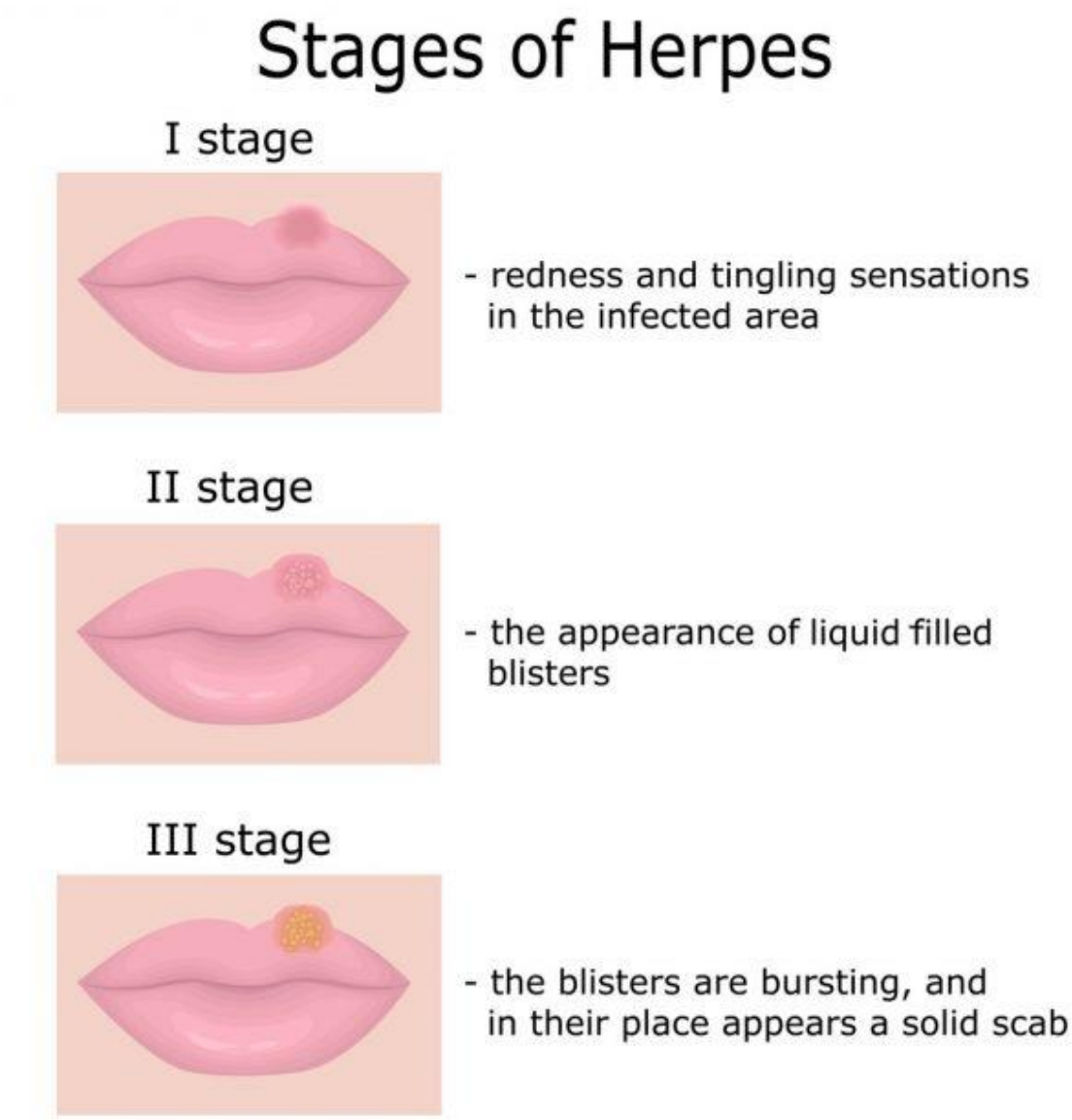
AREAS AFFECTED








HERPES SIMPLEX INFECTION



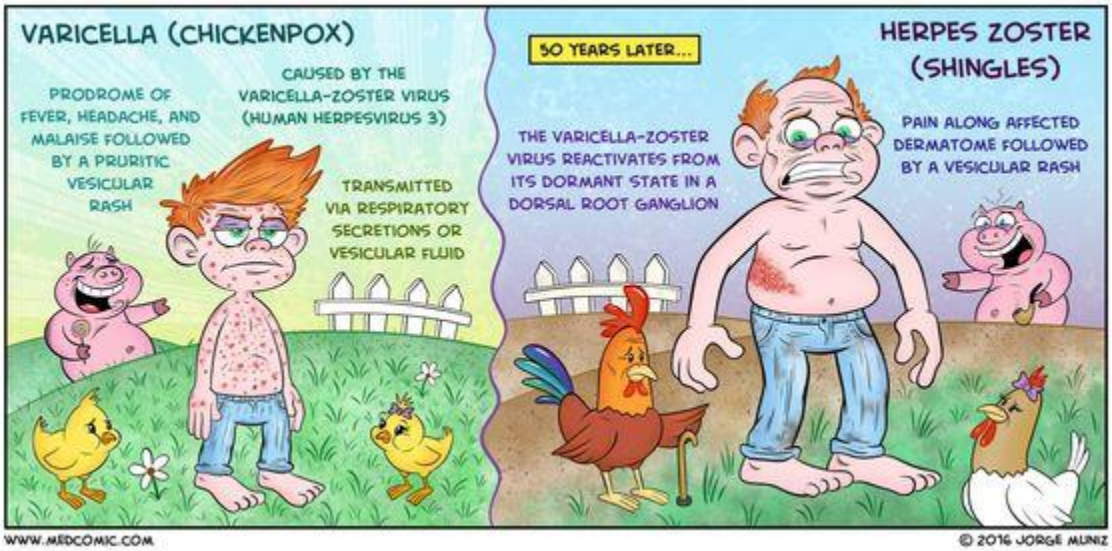
Treatment

Clean the lesion with Chlorhexidin - 4- 6 times a day

If redness develops treat as suggested for impetigo.

For eyes: Acyclovir drops are indicated but this is better prescribed by eye specilaist.

Herpes Zoster infection:


VARICELLA (CHICKENPOX)
PRODROME OF FEVER, HEADACHE, AND MALAISE FOLLOWED BY A PRURITIC VESICULAR RASH
CAUSED BY THE VARICELLA-ZOSTER VIRUS (HUMAN HERPESVIRUS 3)
TRANSMITTED VIA RESPIRATORY SECRETIONS OR VESICULAR FLUID
50 YEARS LATER...
HERPES ZOSTER (SHINGLES)
THE VARICELLA-ZOSTER VIRUS REACTIVATES FROM ITS DORMANT STATE IN A DORSAL ROOT GANGLION
PAIN ALONG AFFECTED DERMATOME FOLLOWED BY A VESICULAR RASH
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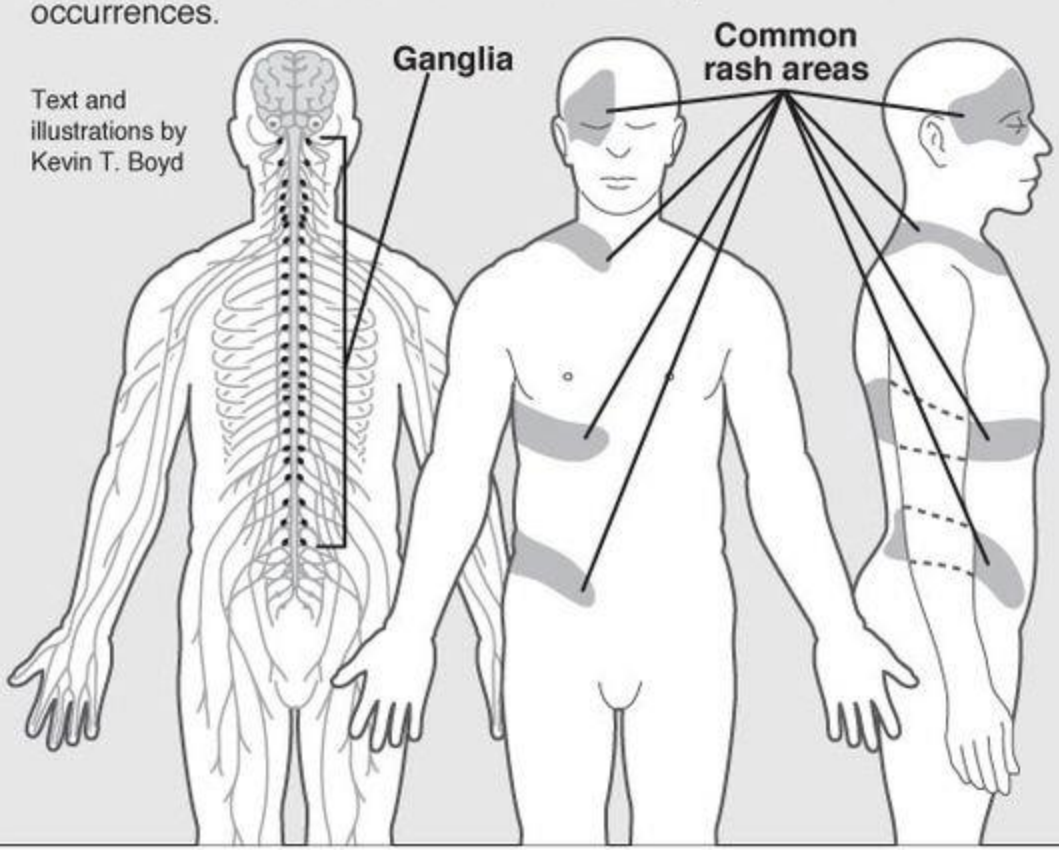
Shingles (herpes zoster)

Shingles, or herpes zoster, is caused by the same virus that causes chickenpox – varicella. Once in the body, the virus lies dormant in clumps of nerves near the spine called ganglia. When the virus erupts from its slumber, it travels along the sensory neurons, causing pain. It invades the skin where the neurons end, causing a rash, blisters and discolored skin.

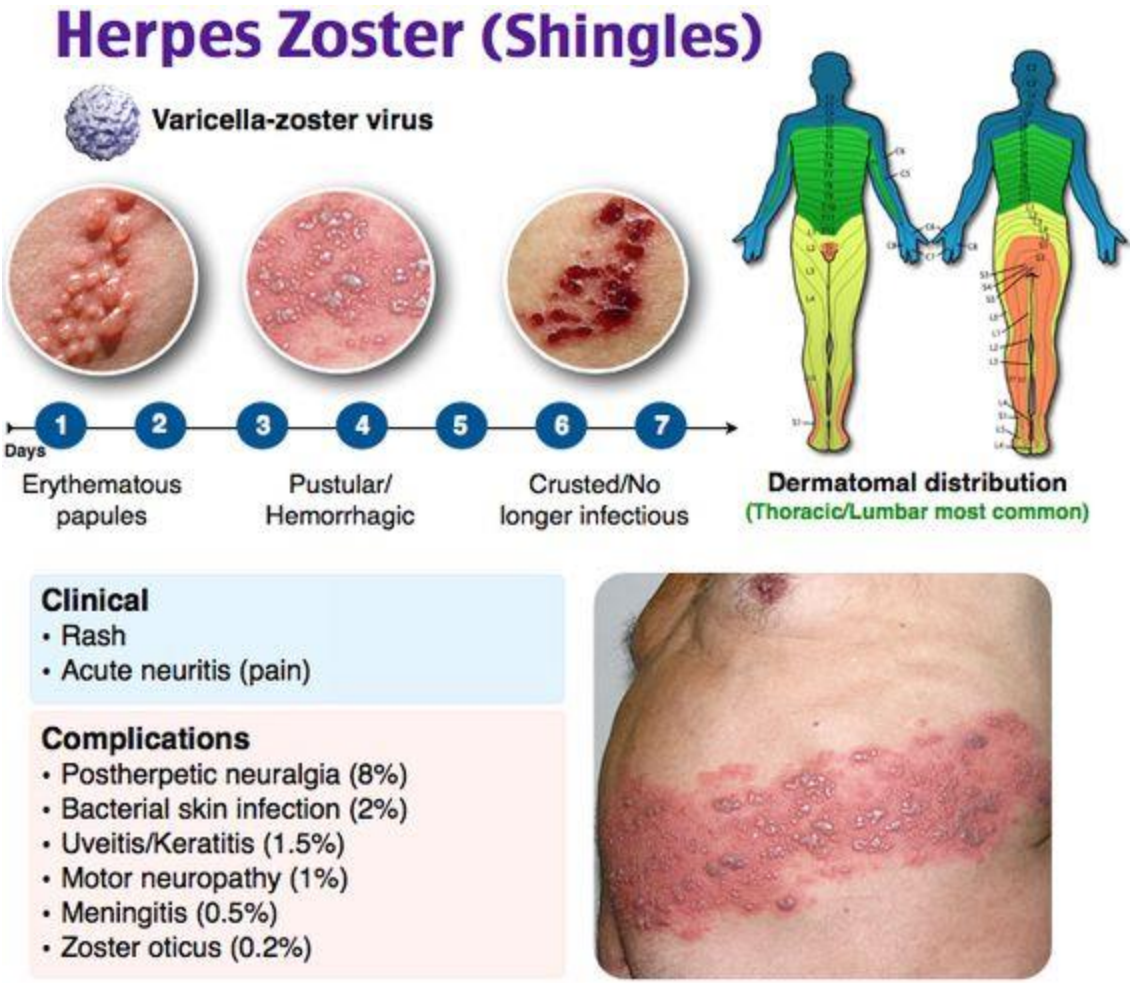
Shingles occur on the chest in about 60 percent of patients, the head and face in about 15 percent, the neck and lower back in 10 percent each, and the lowest part of the spine in 5 percent. Over 99 percent of the time the rash is limited to either the left or right side of the body.

Between 10 and 15 percent of people who suffer from shingles will also experience post-herpetic neuralgia (PHN). These people's nerves are probably damaged during the initial outbreak of shingles, which leaves a legacy of pain. Early treatment with anti-viral drugs when symptoms of shingles first appear can reduce the likelihood and intensity of PHN.

A vaccine is also now available that reduces the risk of getting shinges and PHN, and which is recommended by the CDC for people aged 60 years or older. The greatest value comes if the vaccine is used before the first shingles outbreak, but people who have already had shingles can still use the vaccine to help prevent or reduce future occurrences.



Text and illustrations by Kevin T. Boyd



Treatment of Herpes Zoster

The treatment of herpes zoster has three major objectives: (1) treatment of the acute viral infection, (2) treatment of the acute pain associated with herpes zoster and (3) prevention of postherpetic neuralgia. Antiviral agents, oral corticosteroids and adjunctive individualized pain-management modalities are used to achieve these objectives.

ANTIVIRAL AGENTS

Antiviral agents have been shown to decrease the duration of herpes zoster rash and the severity of pain associated with the rash.However, these benefits have only been demonstrated in patients who received antiviral agents within 72 hours after the onset of rash. Antiviral agents may be beneficial as long as new lesions are actively being formed, but they are unlikely to be helpful after lesions have crusted.

The effectiveness of antiviral agents in preventing postherpetic neuralgia is more controversial. Numerous studies evaluating this issue have been conducted, but the results have been variable. Based on the findings of multiple studies, acylovir (Zovirax) therapy appears to

produce a moderate reduction in the development of postherpetic neuralgia. Other antiviral agents, specifically valacyclovir (Valtrex) and famciclovir (Famvir), appear to be at least as effective as acyclovir.

Acyclovir, the prototype antiviral drug, is a DNA polymerase inhibitor. Acyclovir may be given orally or intravenously. Major drawbacks of orally administered acyclovir include its lower bioavailability compared with other agents and its dosing frequency (five times daily). Intravenously administered acyclovir is generally used only in patients who are severely immunocompromised or who are unable to take medications orally.

Valacyclovir, a prodrug of acyclovir, is administered three times daily. Compared with acyclovir, valacyclovir may be slightly better at decreasing the severity of pain associated with herpes zoster, as well as the duration of postherpetic neuralgia.Valacyclovir is also more bioavailable than acyclovir, and oral administration produces blood drug levels comparable to the intravenous administration of acyclovir.

Famciclovir is also a DNA polymerase inhibitor. The advantages of famciclovir are its dosing schedule (three times daily), its longer intracellular half-life compared with acyclovir and its better bioavailability compared with acyclovir and valacyclovir.

The choice of which antiviral agent to use is individualized. Dosing schedule and cost may be considerations. The recommended dosages for acyclovir, famciclovir and valacyclovir. All three antiviral agents are generally well tolerated. The most common adverse effects are nausea, headache, vomiting, dizziness and abdominal pain.

CORTICOSTEROIDS

Orally administered corticosteroids are commonly used in the treatment of herpes zoster, even though clinical trials have shown variable results. Prednisone used in conjunction with acyclovir has been shown to reduce the pain associated with herpes zoster.The likely mechanism involves decreasing the degree of neuritis caused by active infection and, possibly, decreasing residual damage to affected nerves.

Some studies designed to evaluate the effectiveness of prednisone therapy in preventing postherpetic neuralgia have shown decreased pain at three and months.Other studies have demonstrated no benefit.

If the use of orally administered prednisone is not contraindicated, adjunctive treatment with this agent is justified on the basis of its effects in reducing pain, despite questionable evidence for its benefits in decreasing the incidence of postherpetic neuralgia. Given the theoretic risk of immunosuppression with corticosteroids, some investigators believe that these agents should be used only in patients more than 50 years of age because they are at greater risk of developing postherpetic neuralgia.

ANALGESICS

The pain associated with herpes zoster ranges from mild to excruciating. Patients with mild to moderate pain may respond to over-the-counter analgesics. Patients with more severe pain may require the addition of a narcotic medication. When analgesics are used, with or without a narcotic, a regular dosing schedule results in better pain control and less anxiety than "as-needed" dosing.

Lotions containing calamine (e.g., Caladryl) may be used on open lesions to reduce pain and pruritus. Once the lesions have crusted over, capsaicin cream (Zostrix) may be applied. Topically administered lidocaine (Xylocaine) and nerve blocks have also been reported to be effective in reducing pain.

OCULAR INVOLVEMENT

Ocular herpes zoster is treated with orally administered antiviral agents and corticosteroids, the same as involvement elsewhere. Although most patients with ocular herpes zoster improve without lasting sequelae, some may develop severe complications, including loss of vision. When herpes zoster involves the eyes, ophthalmologic consultation is usually recommended.

PREVENTIVE TREATMENT

The morbidity and mortality of herpes zoster could be reduced if a safe and effective preventive treatment were available. It is unusual for a patient to develop herpes zoster more than once, suggesting that the first reactivation of varicella-zoster virus usually provides future immunologic protection. Studies are currently being conducted to evaluate the efficacy of the varicella-zoster vaccine in preventing or modifying herpes zoster in the elderly.

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G-Friends

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PROTOCOL

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